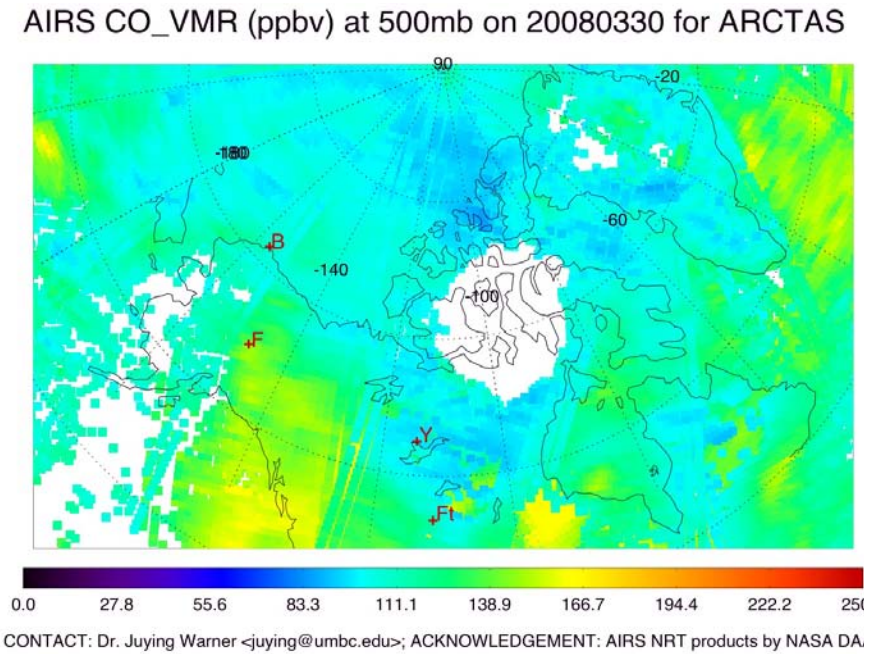
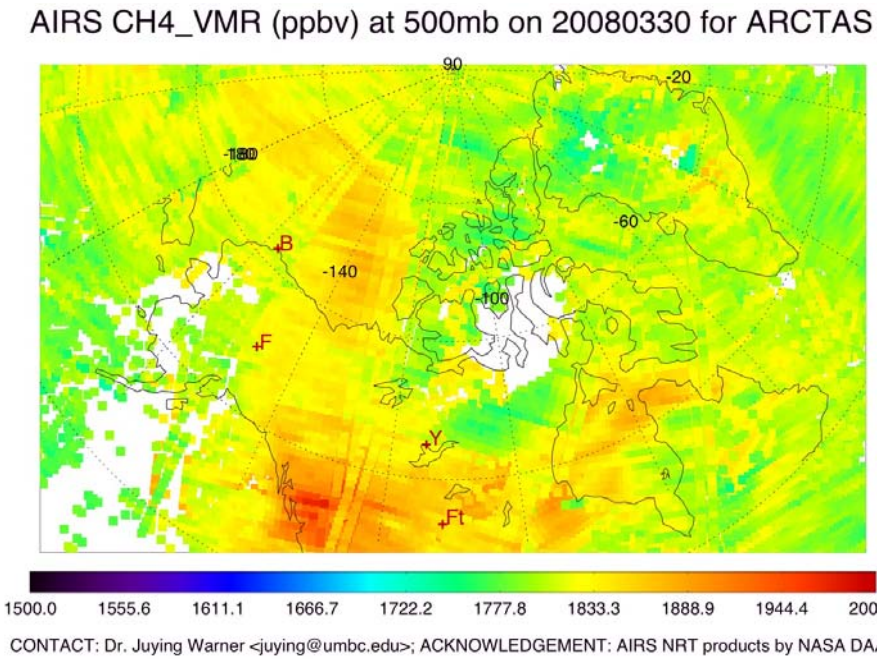
AIRS NRT ARCTAS Support: latest CO & CH_4

Juying Warner and Zigang Wei

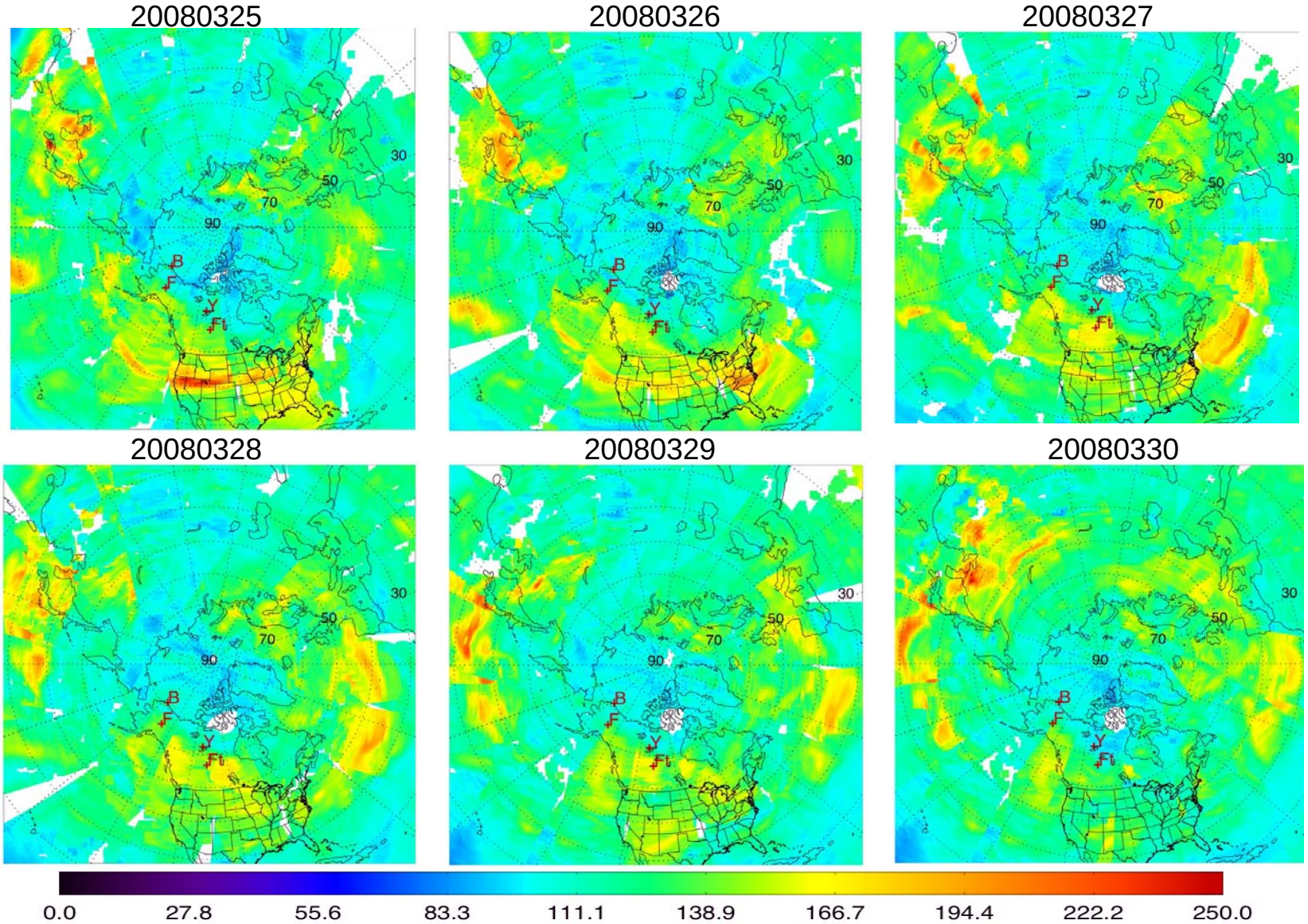




- AIRS CO at 500mb (ppbv) show similar patterns over the Arctic region for the last few days
- Local CO over Barrow and some transported CO at Ft. McMurray
- Higher CH_4 concentrations over the West coast of Canada.

AIRS NRT ARCTAS Support: CO Transport

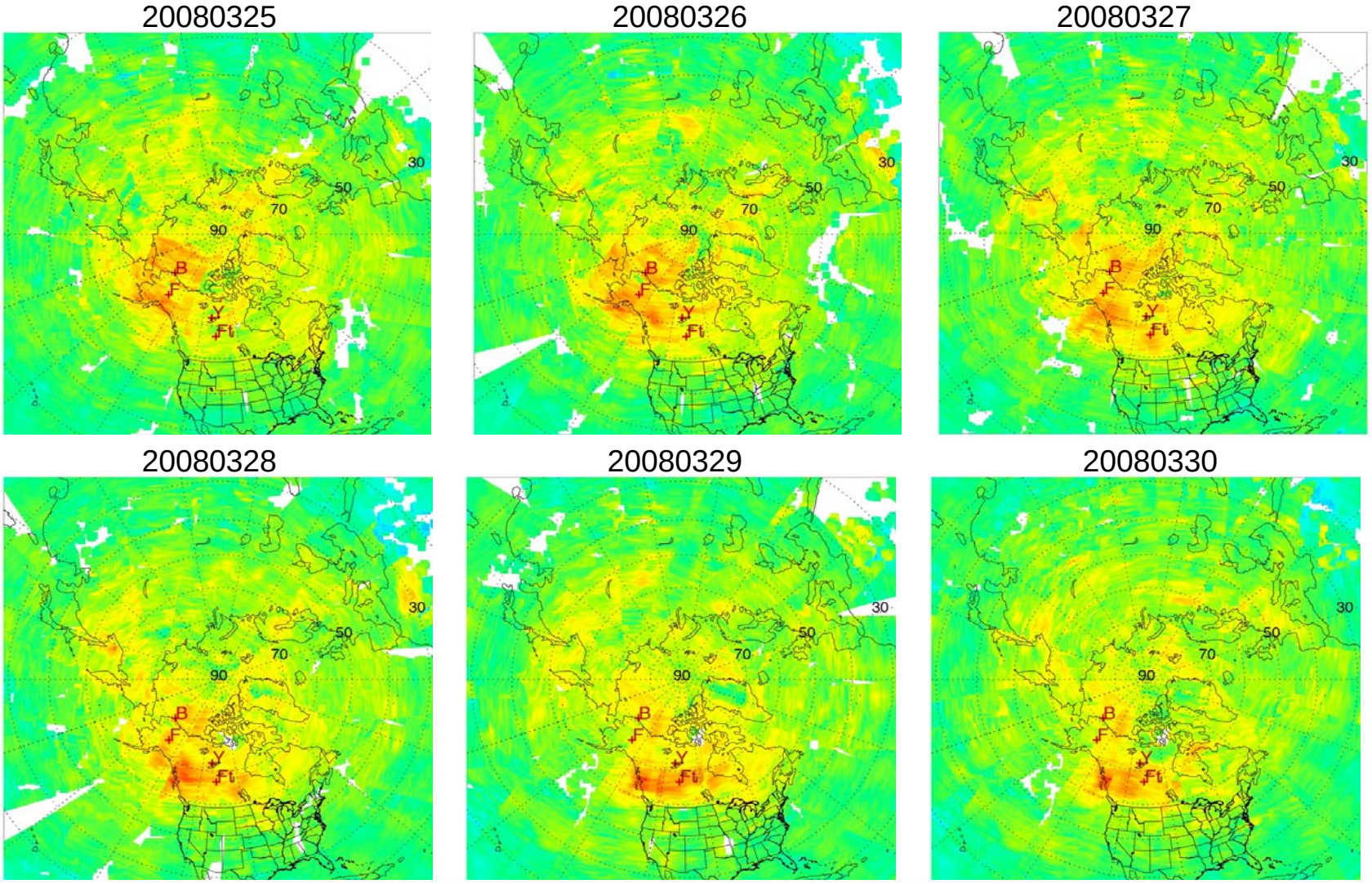
CO Transport affects Ft. McMurray not Barrow



CONTACT: Dr. Juying Warner <juying@umbc.edu>; ACKNOWLEDGEMENT: AIRS NRT products by NASA DAAC

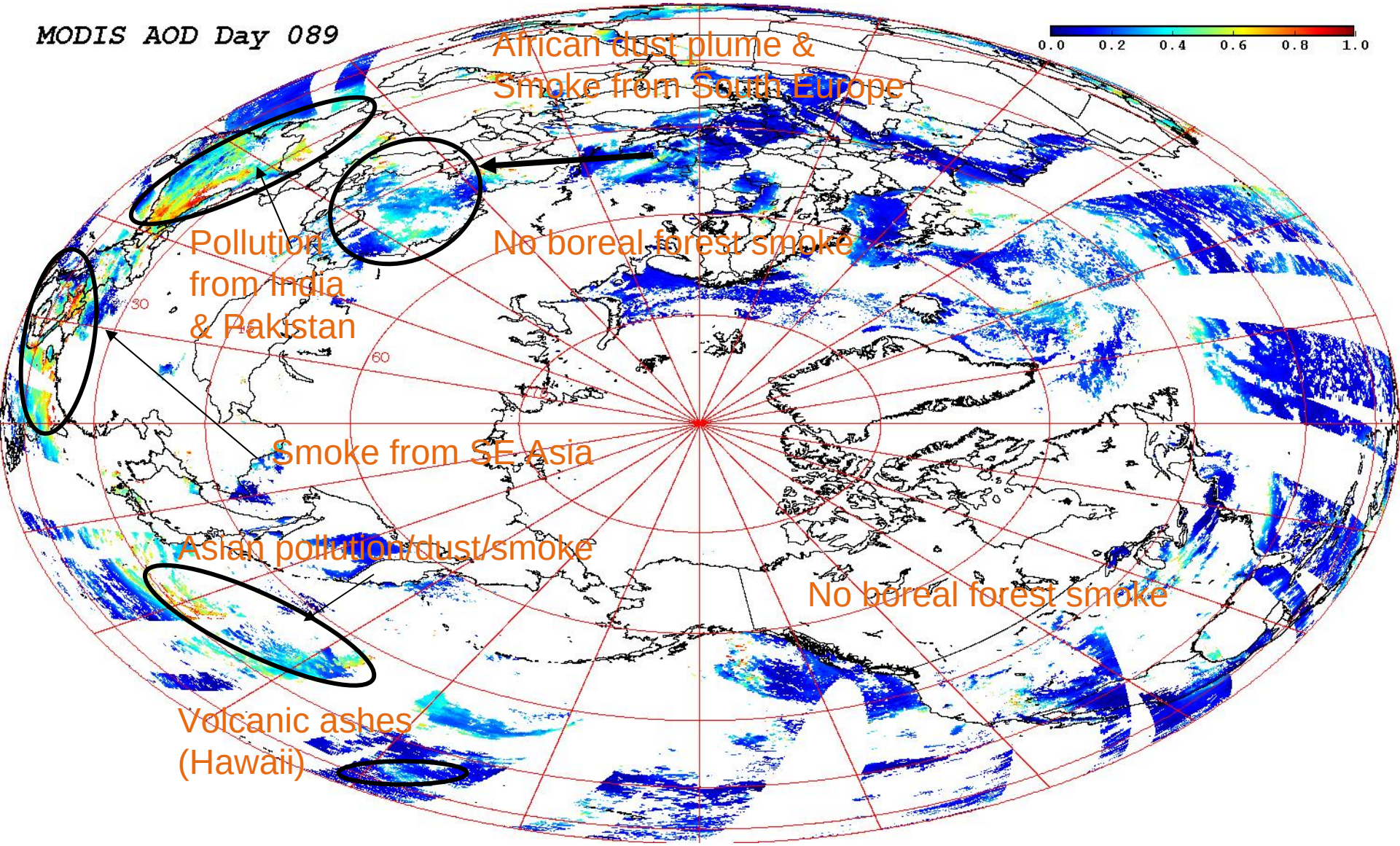
AIRS NRT ARCTAS Support: CH4 Changes

Continued high concentrations over Alaska and West Coast of Canada

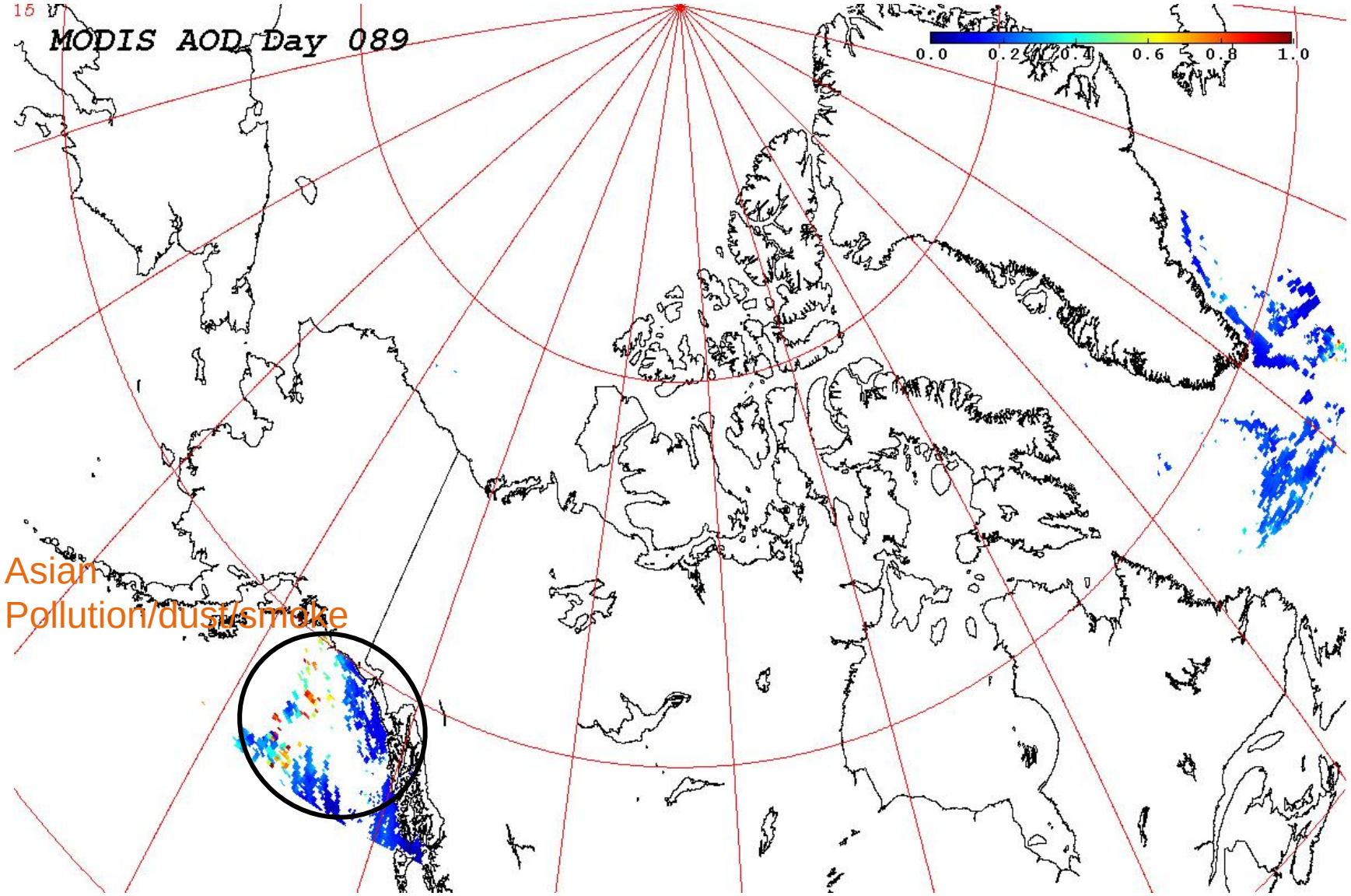


CONTACT: Dr. Juying Warner <juying@umbc.edu>; ACKNOWLEDGEMENT: AIRS NRT products by NASA DAAC

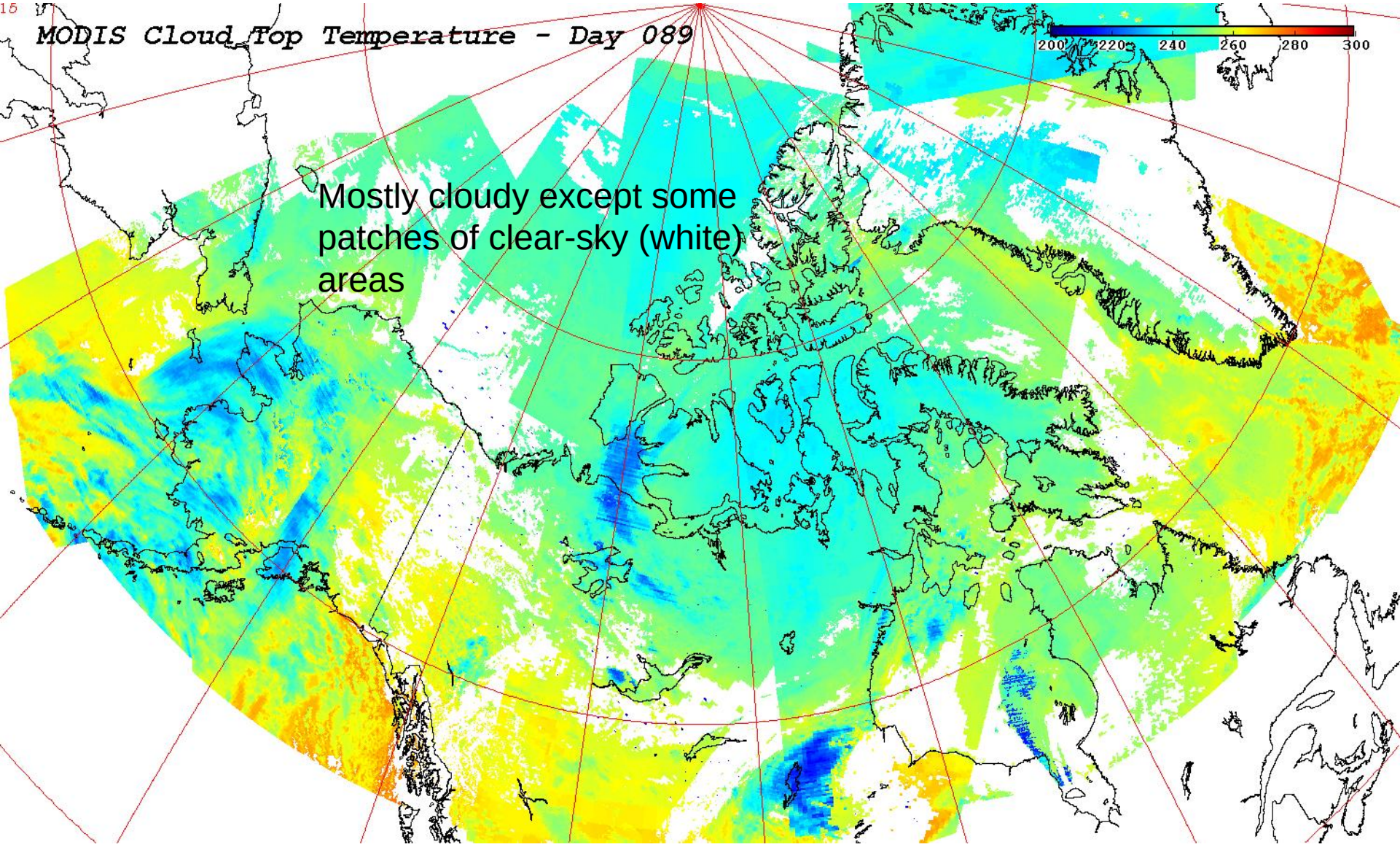
MODIS AOD Hot Spots in Northern Hemisphere (0° - 90°N)



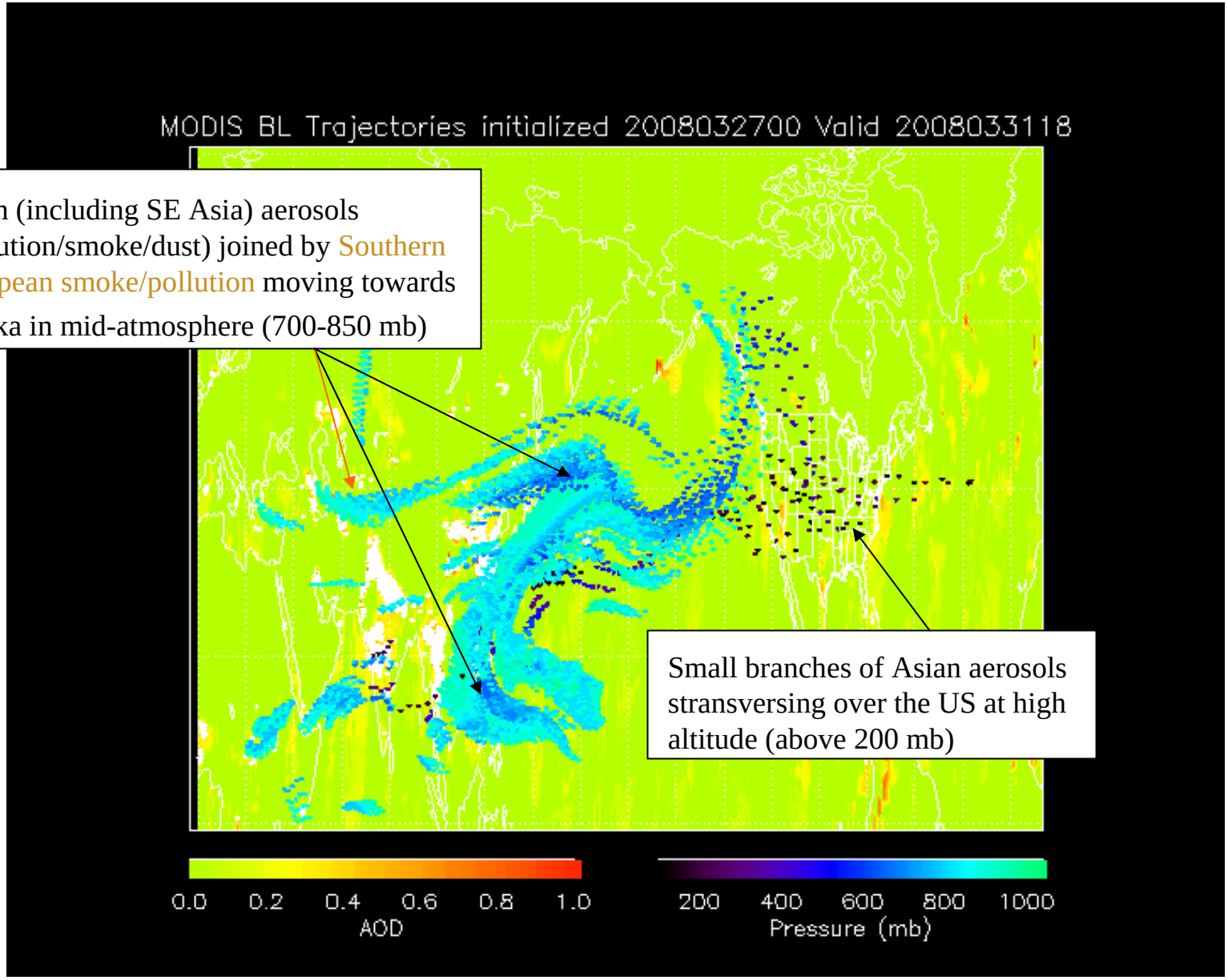
MODIS AOD Hot Spots in Flight Domain



MODIS Cloud Top Temperature in Flight Domain



Aerosol Trajectory Based Upon MODIS AOD and GEOS-5 Winds



Asian (including SE Asia) aerosols (pollution/smoke/dust) joined by Southern European smoke/pollution moving towards Alaska in mid-atmosphere (700-850 mb)

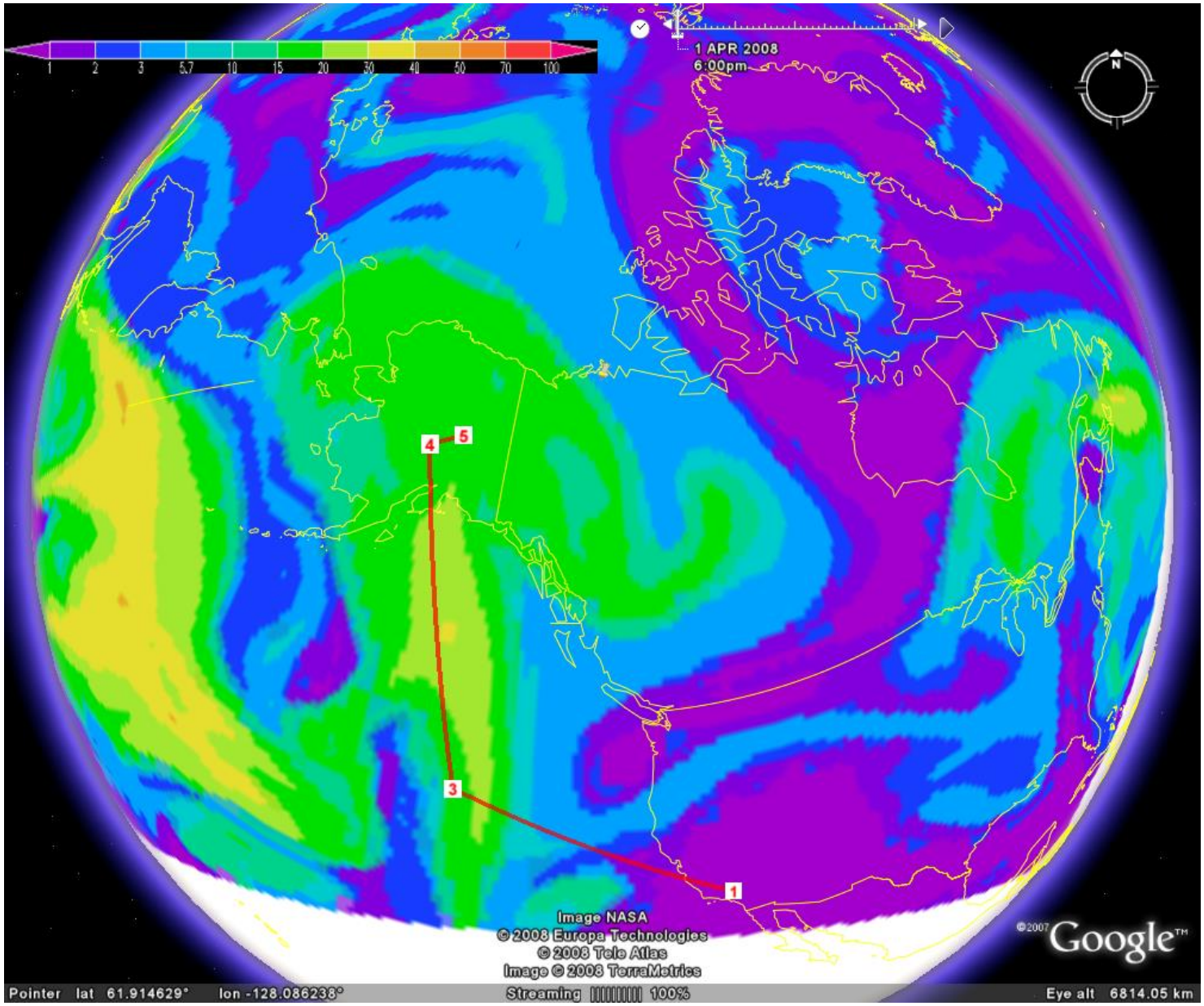
Small branches of Asian aerosols stransversing over the US at high altitude (above 200 mb)

(Courtesy: Brad Pierce & Duncan Fairlei for Trajectory Package)

University of Iowa STEM Model

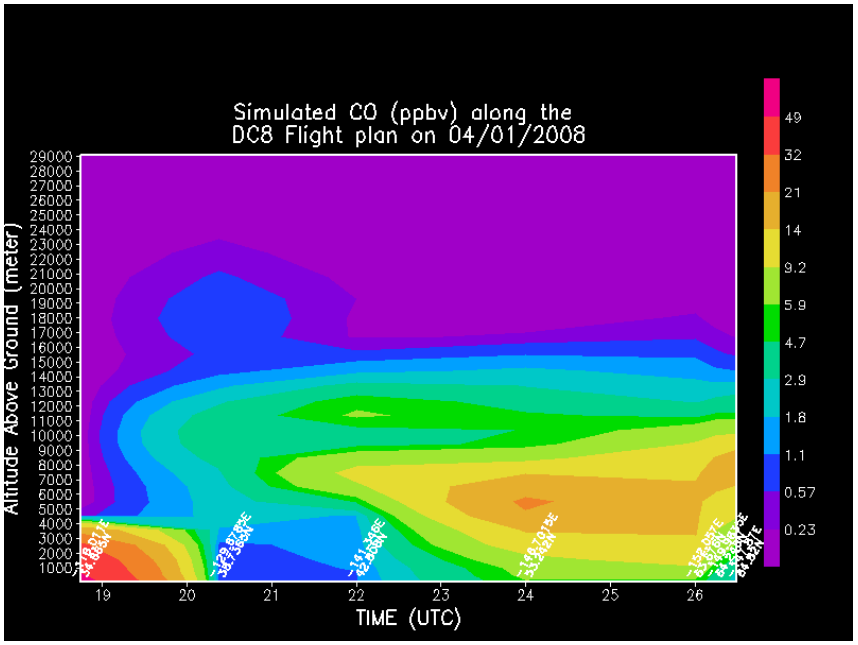
Flight planning meeting

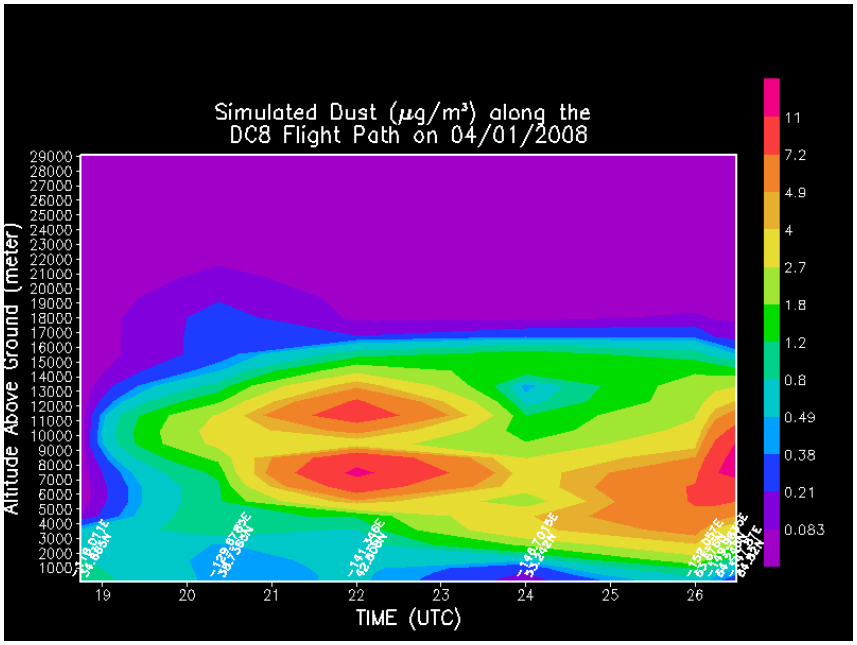
03-30-2008



Anthropogenic CO, at 8.4 km, 18Z (April 1) , STEM model 66 hr forecast

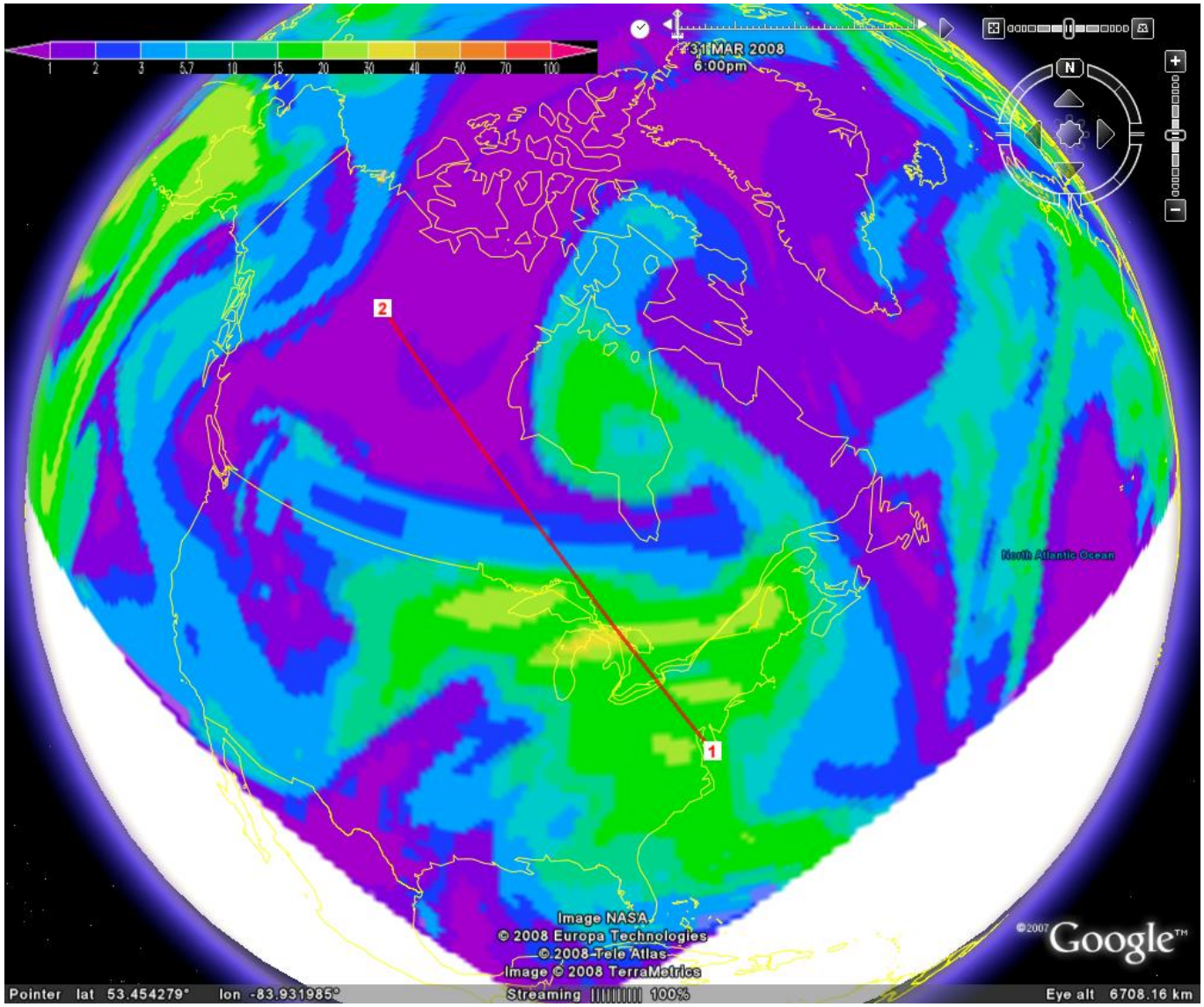
DC8 April 1 curtain





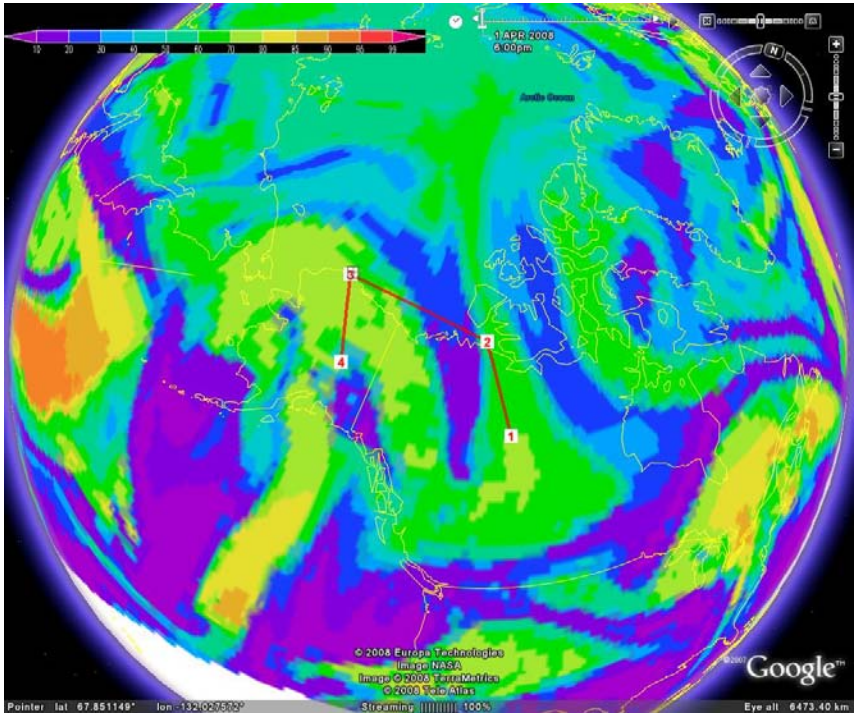
USA **Asia Biomass** China Europe

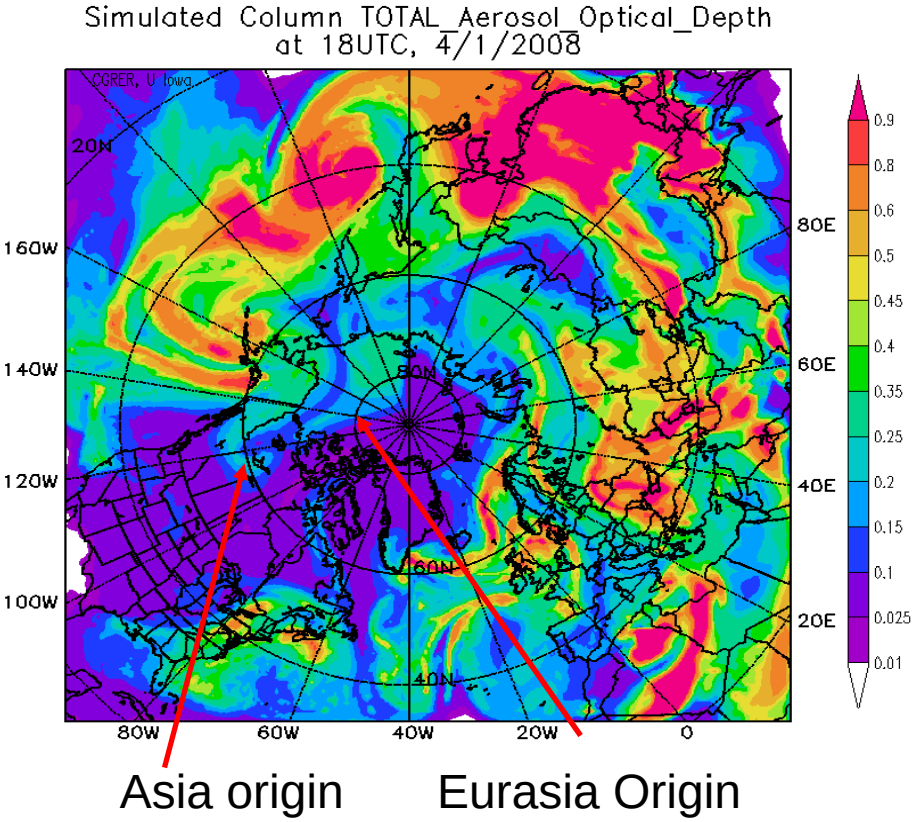
Along the flight path we see air masses from different source regions



Anthropogenic CO, 5.5 km layer, 18Z 31st March,
Expect to see some N America biomass and pollution.

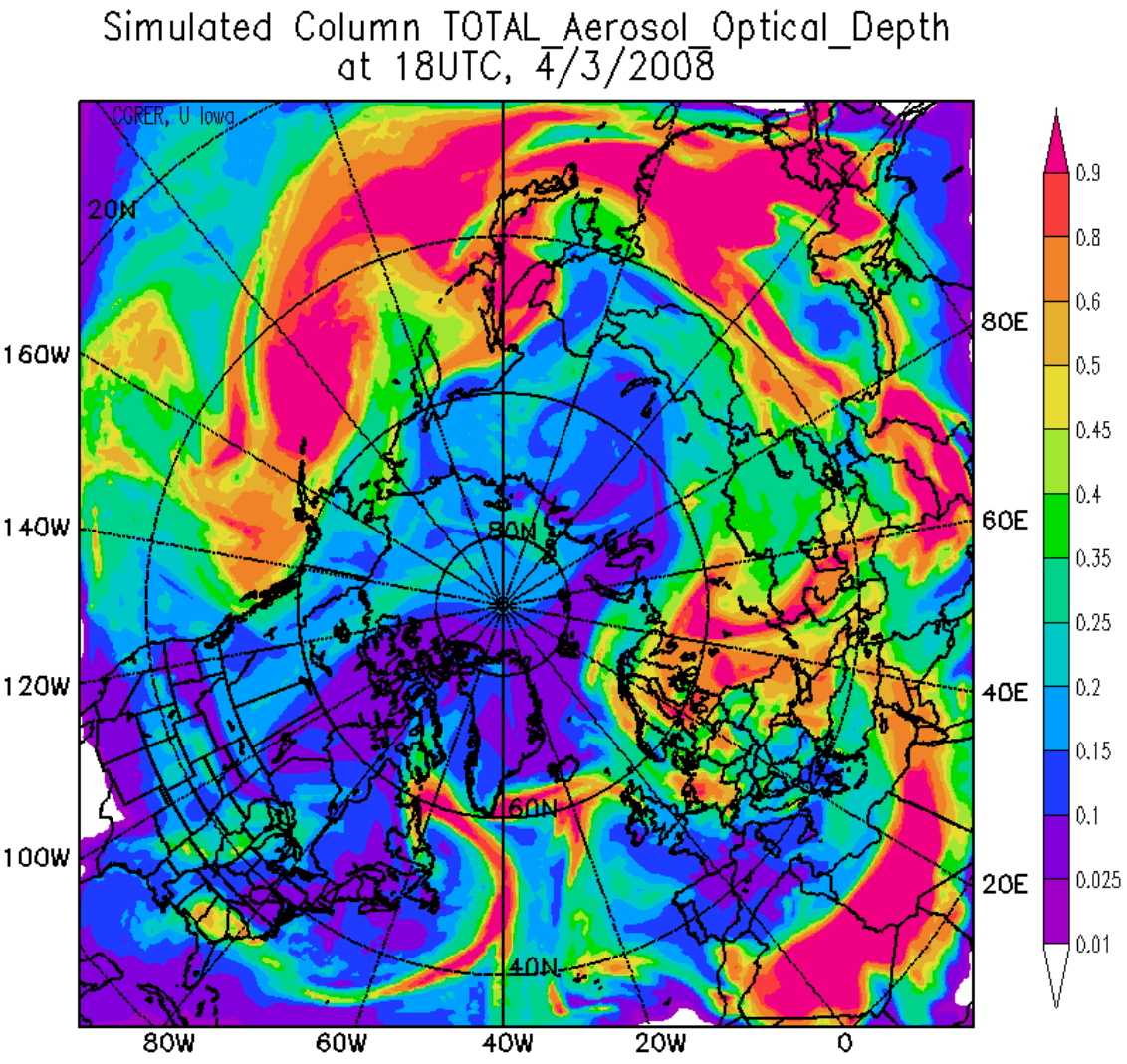
April 1 flight for P3





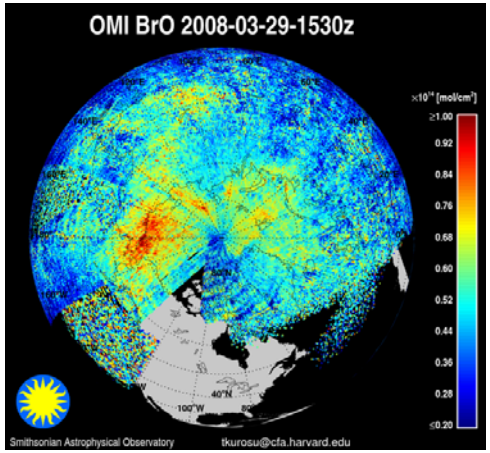
Left panel: RH at 5.5 KM, 18Z on April 1. Right panel: Total AOD. Area of enhanced AOD south of Pt 2 (70 N, 120 W) is of Asia origin. Leg from 1-2 encounters air of EurAsia origin. Area of low RH between pts 2-3. Estimated flight time is 5.5 hours (room for spirals).

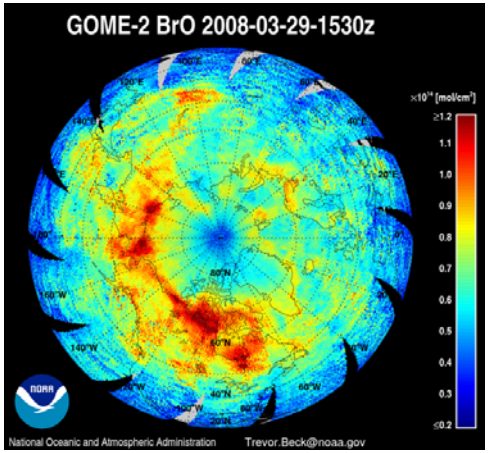
DC8 outlook for April 3



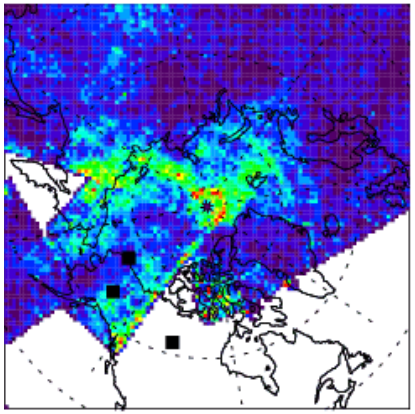
- 114 hour forecast
- From Fairbanks to Thule we expect to see elevated AOD from pollution of differing origin.
- Longitudinal gradient of Asian, European, and North American air-masses.

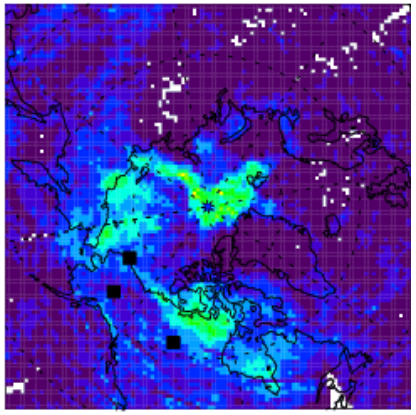
Total BrO columns

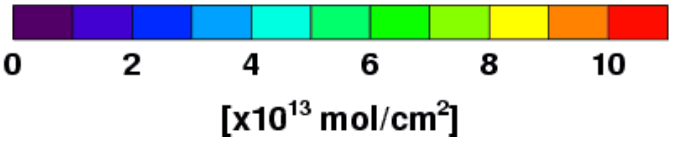




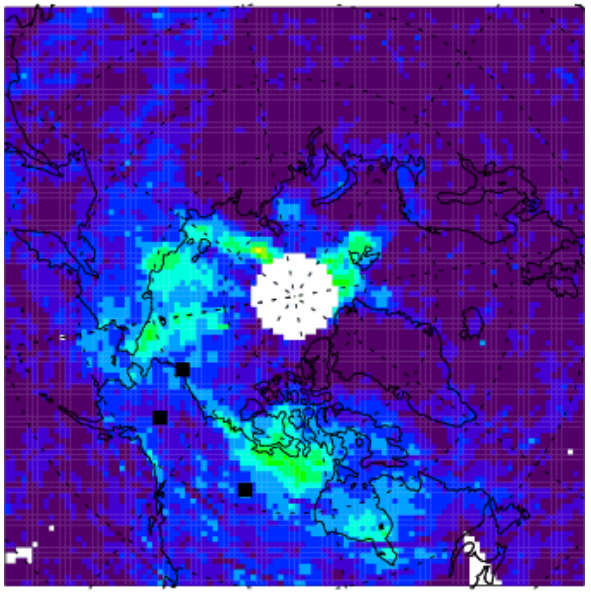
Boundary BrO columns

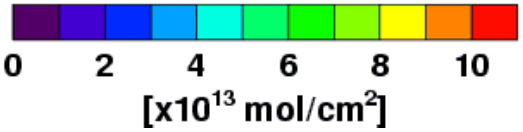






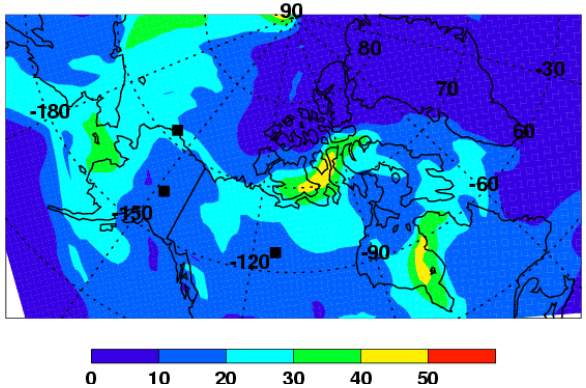
Merged BrO VCD as model input

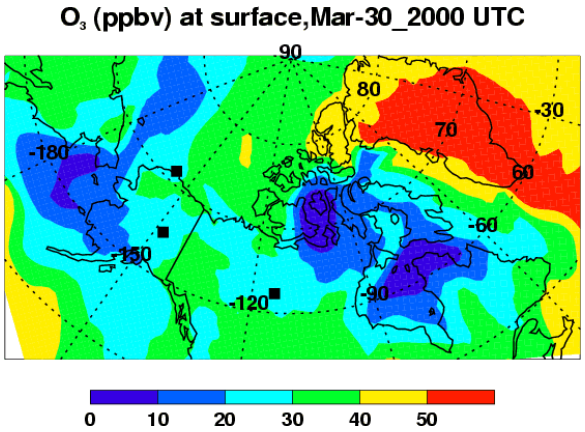


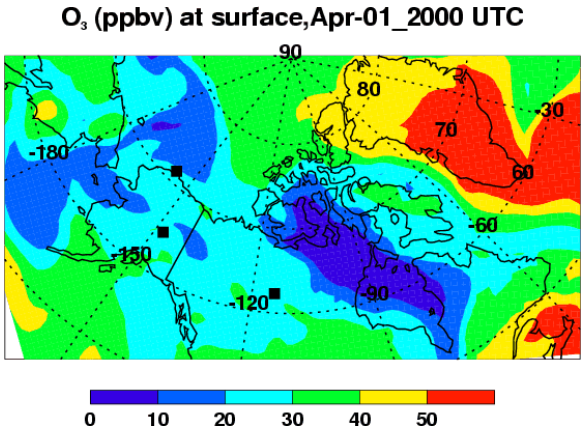


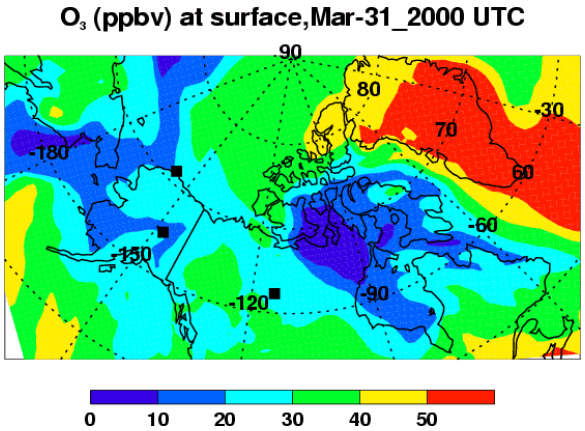
Surface Ozone forecast at noon in 4 days

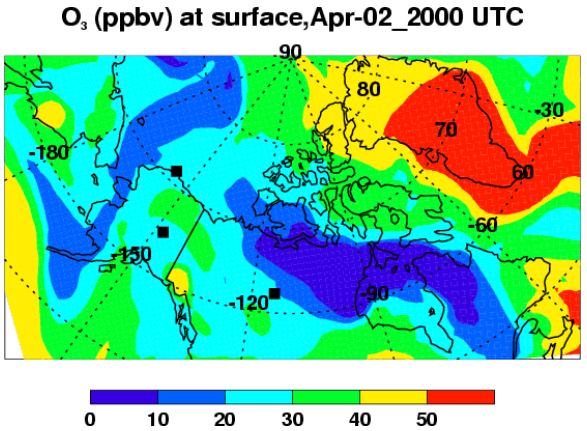
BrO on March, 29

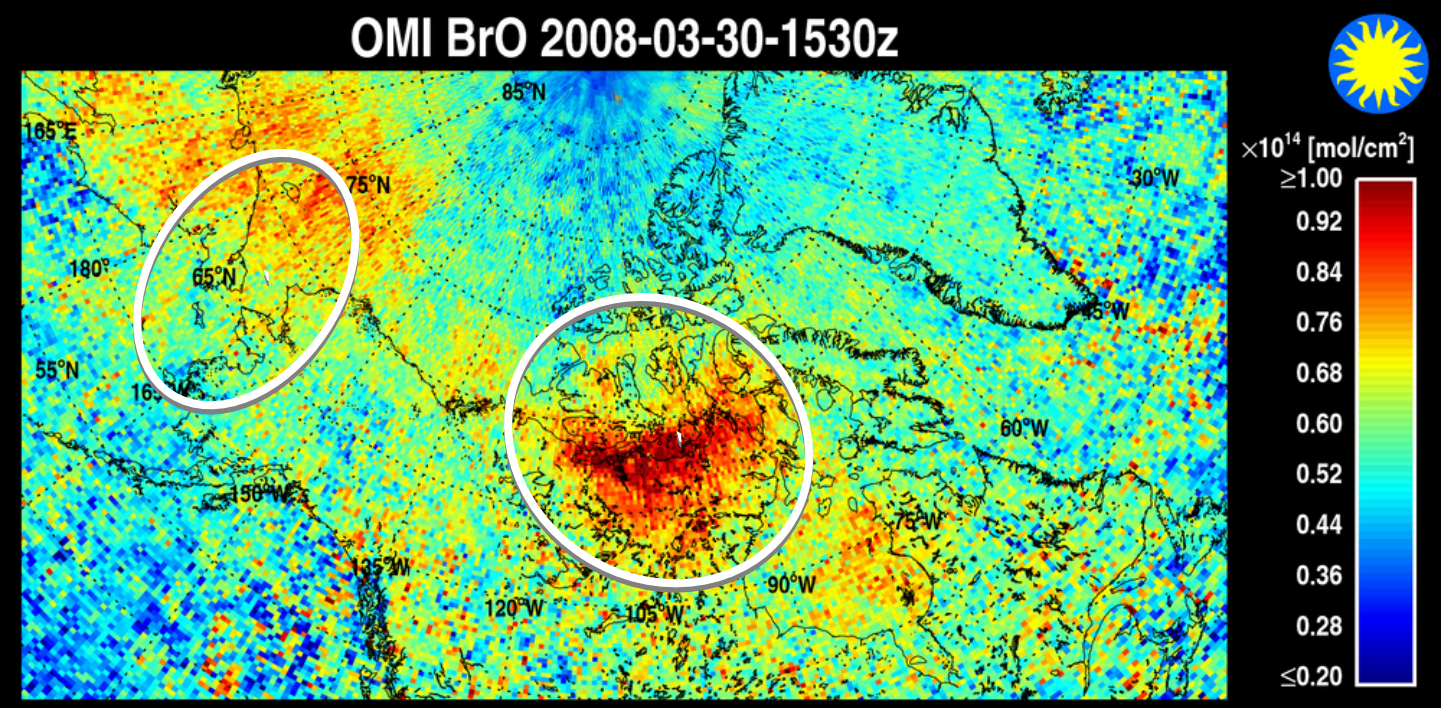


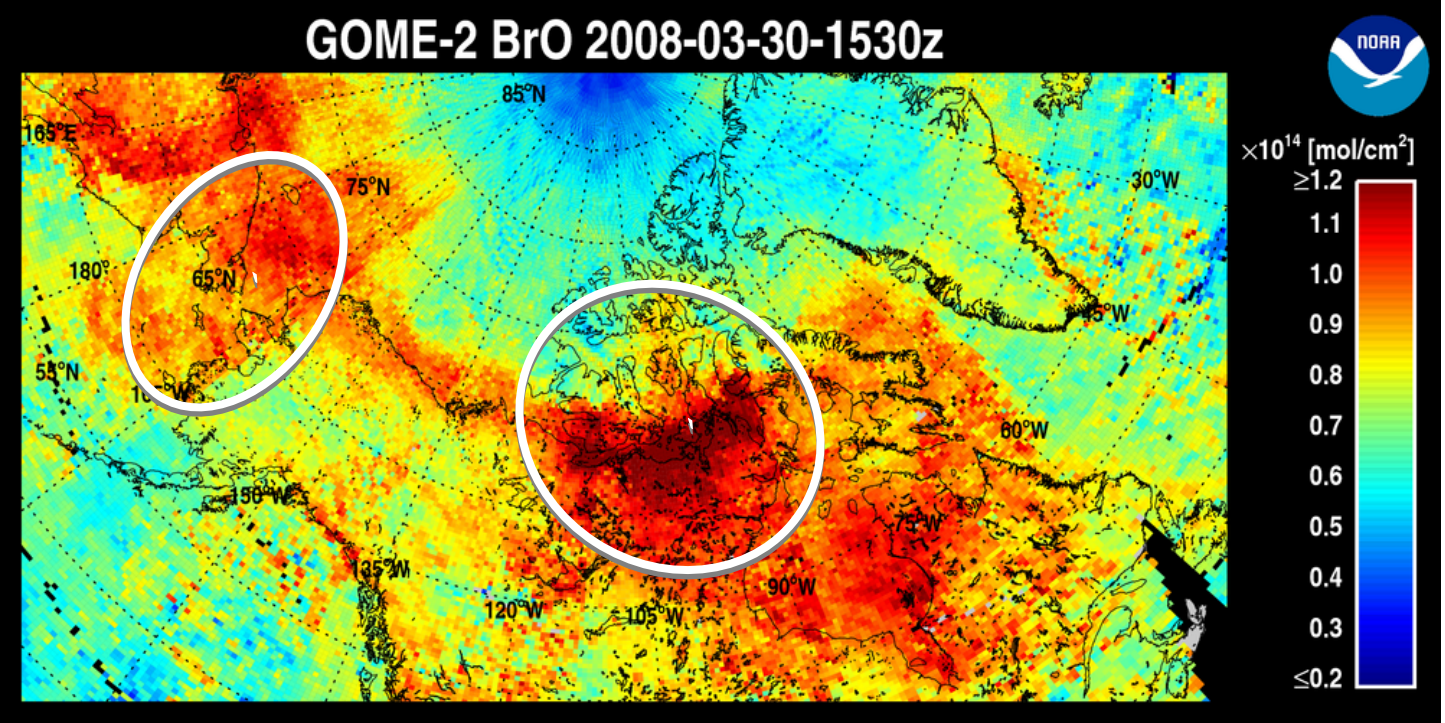








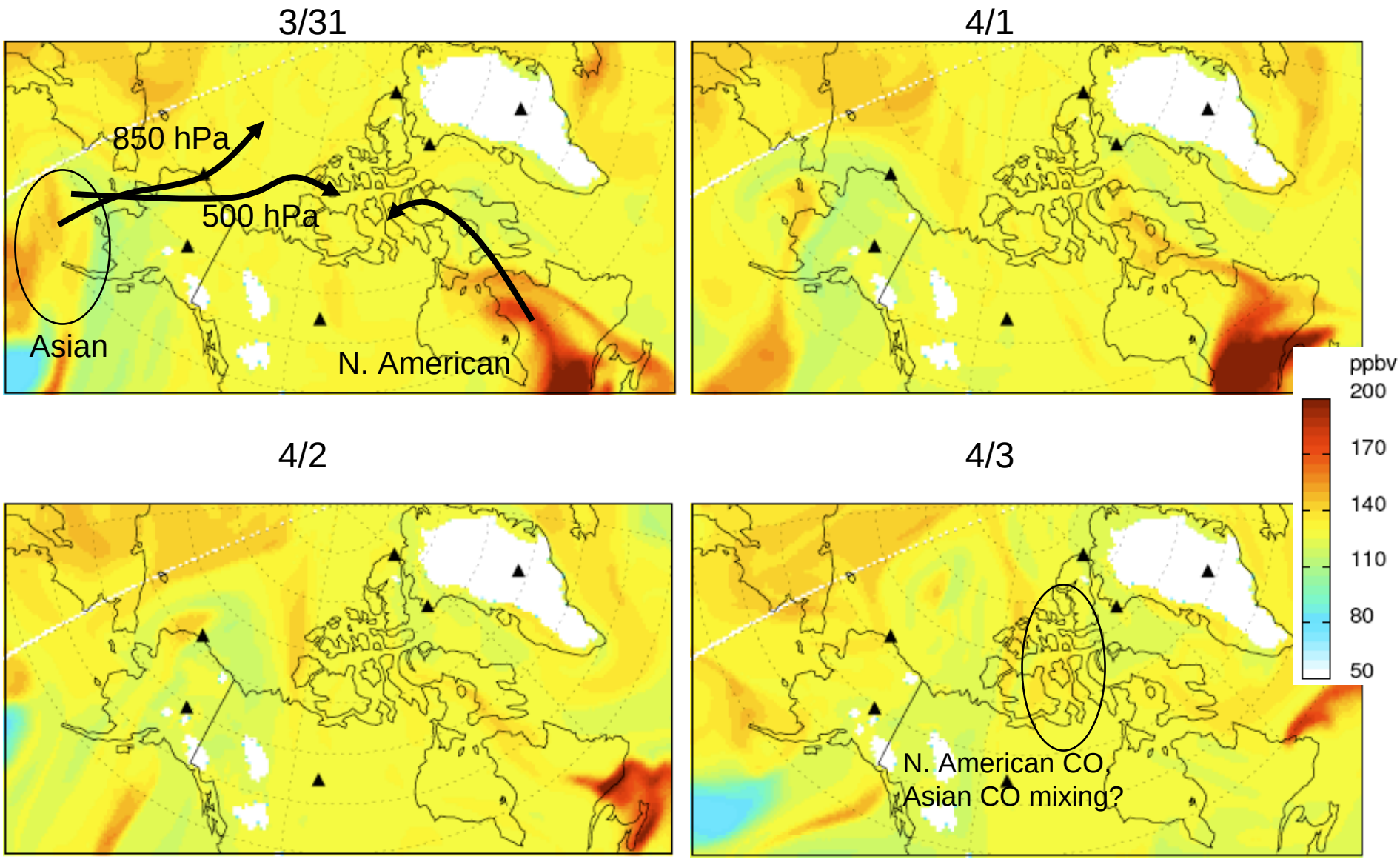




BrO columns have decreased since 3/28

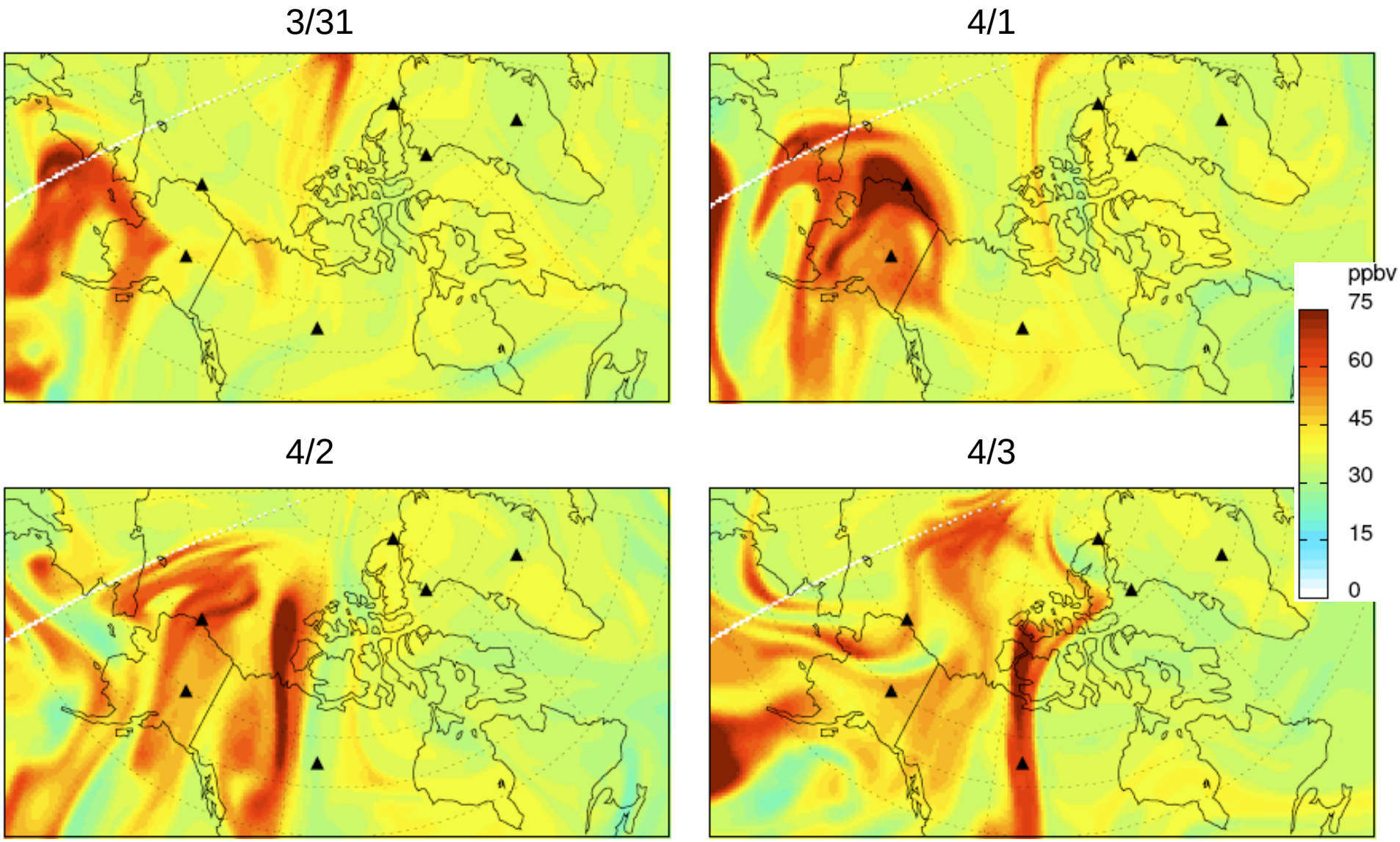
Bering Strait and Queen Elizabeth Islands

GEOS Total CO 850 hPa



Initialized 03/30/2008 – 06z

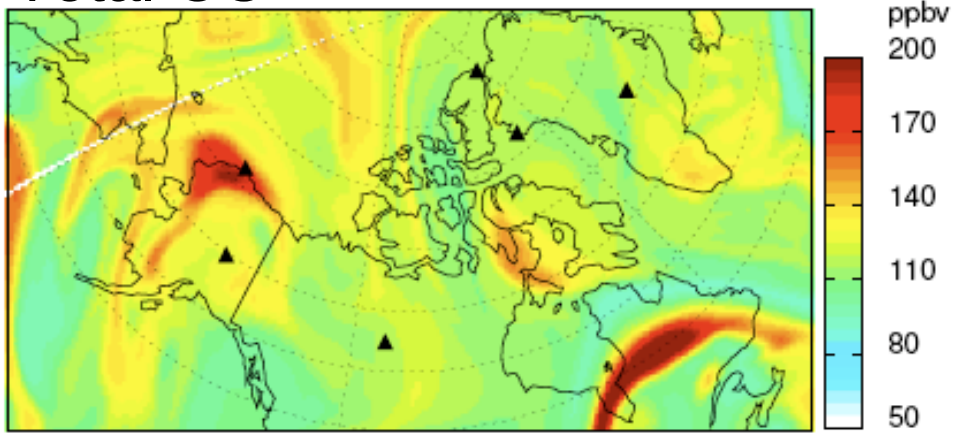
GEOS Asian CO 500 hPa



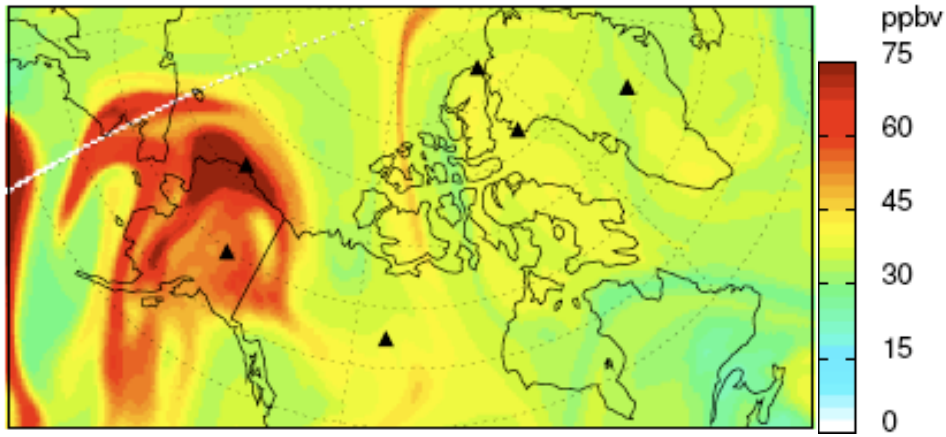
Initialized 03/30/2008 – 06z

Asian pollution over Barrow on 4/01 - P3 Flight Opportunity?

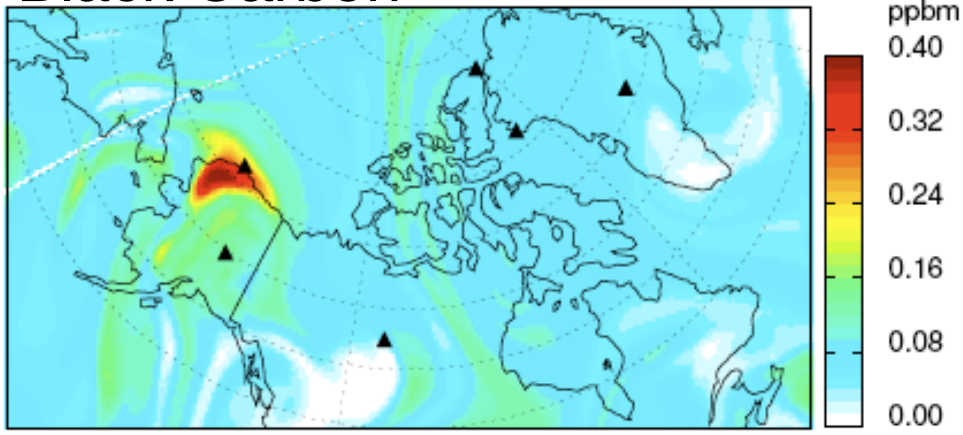
Total CO



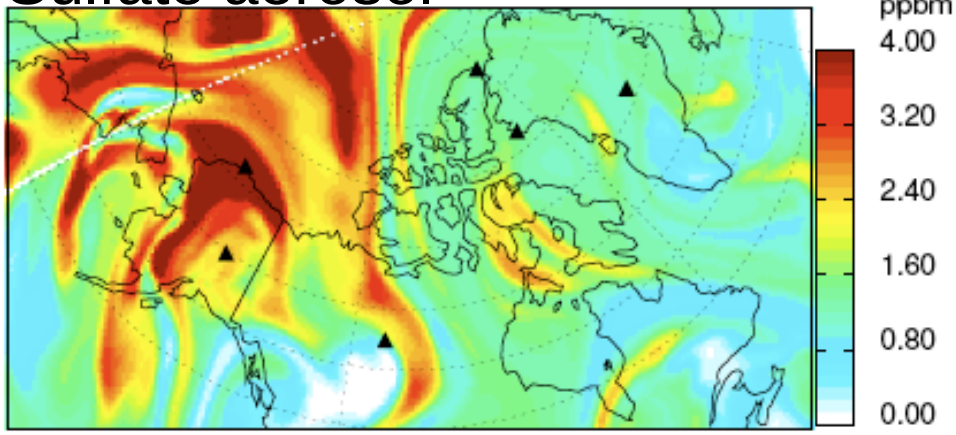
Asian CO



Black Carbon



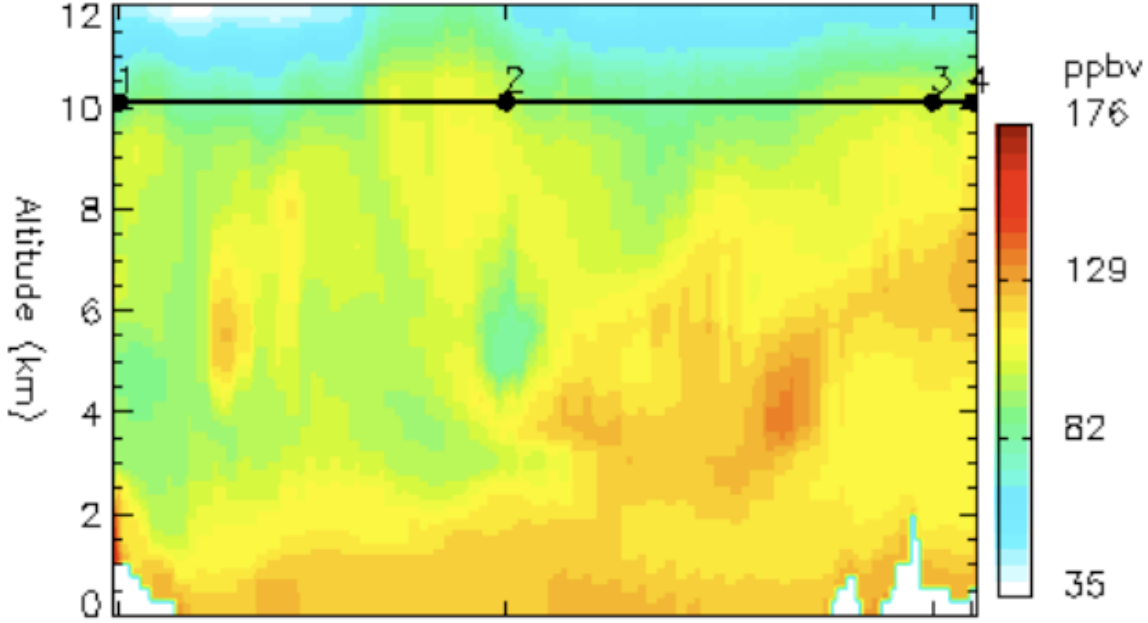
Sulfate aerosol

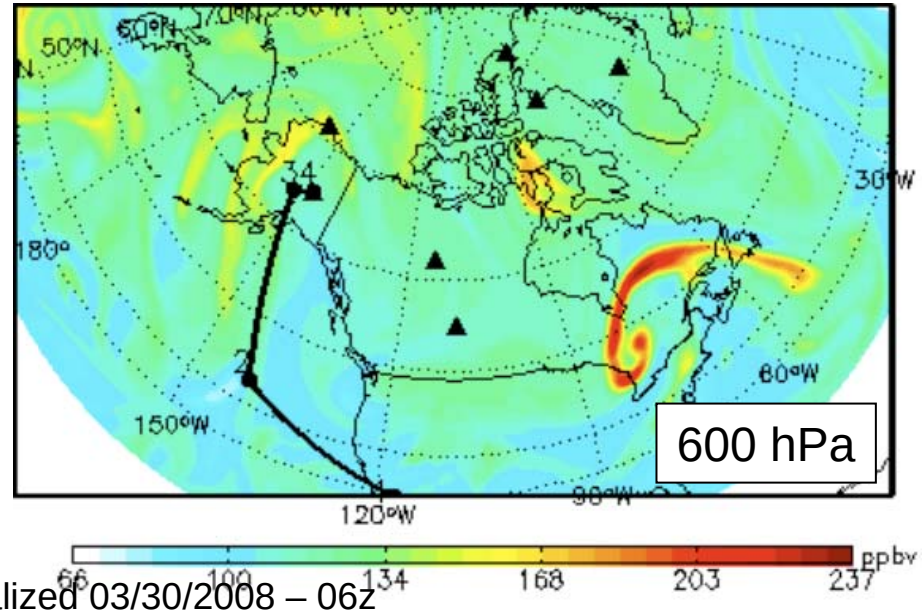


All 500 hPa

Initialized 03/30/2008 – 06z

CO along proposed DC8 flight track





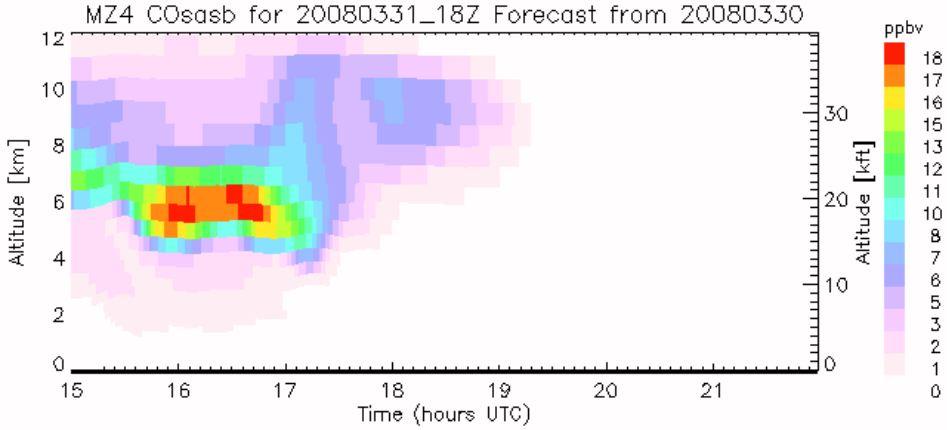
Initialized 03/30/2008 – 06z

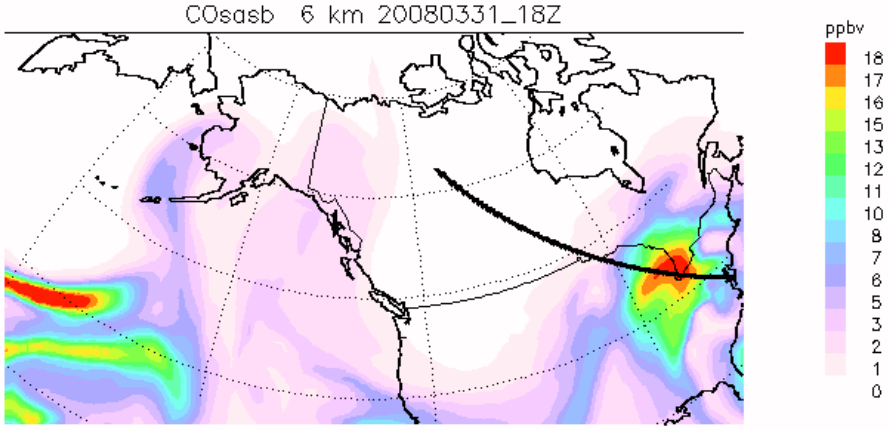
Mar 31 P-3 Wallops to Yellowknife

MOZART-4/GFS forecasts from Mar 30 for Mar 31 18Z

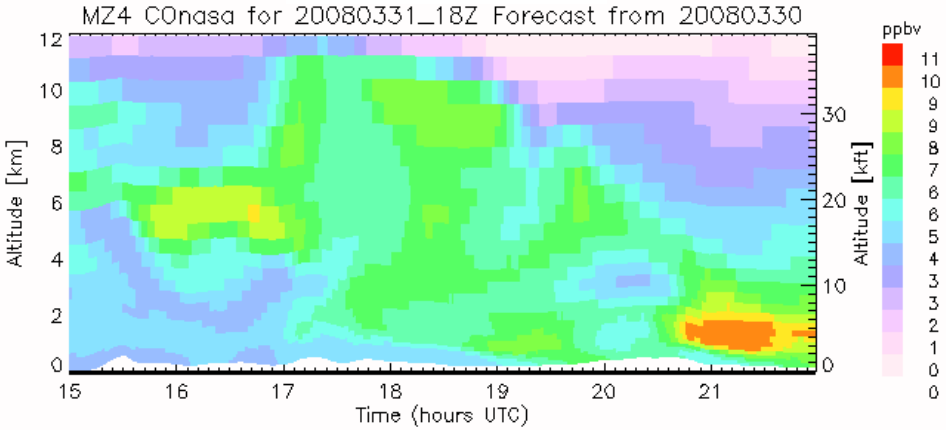
- Biomass burning plume from S. Asia at 6 km over Great Lakes
- N.Asia anthro plume at low alts on approach to Yellowknife

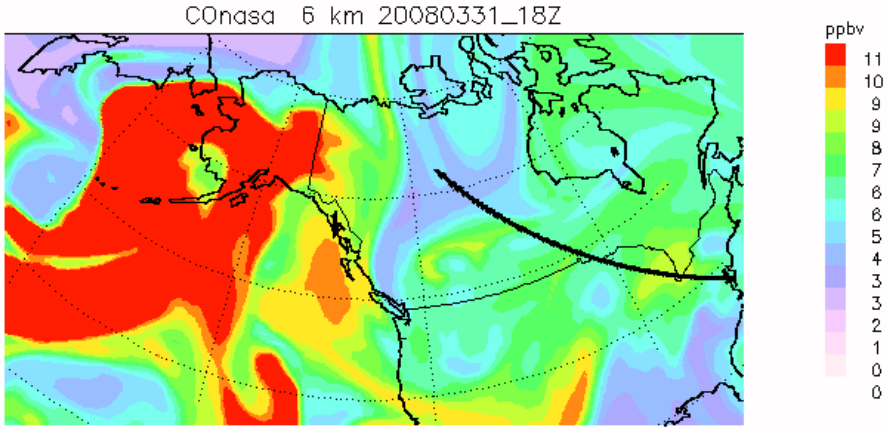
S.Asia Fires





N.Asia Anthro



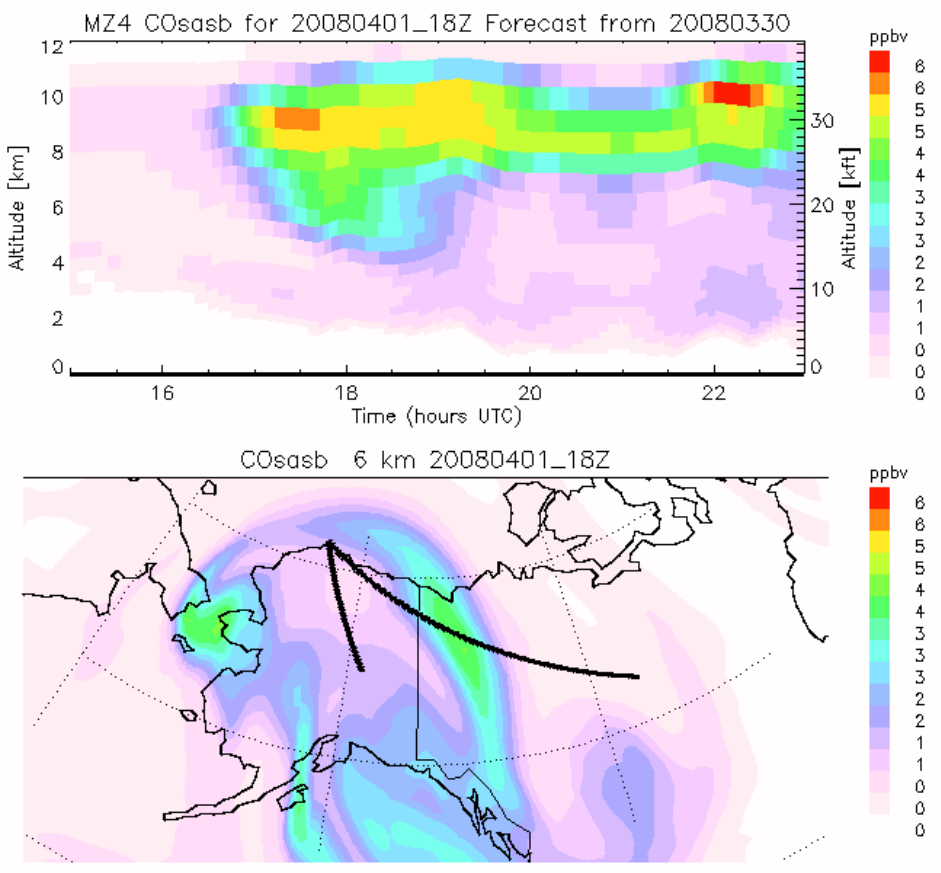


Apr 1 P-3 Yellowknife to Fairbanks via Barrow

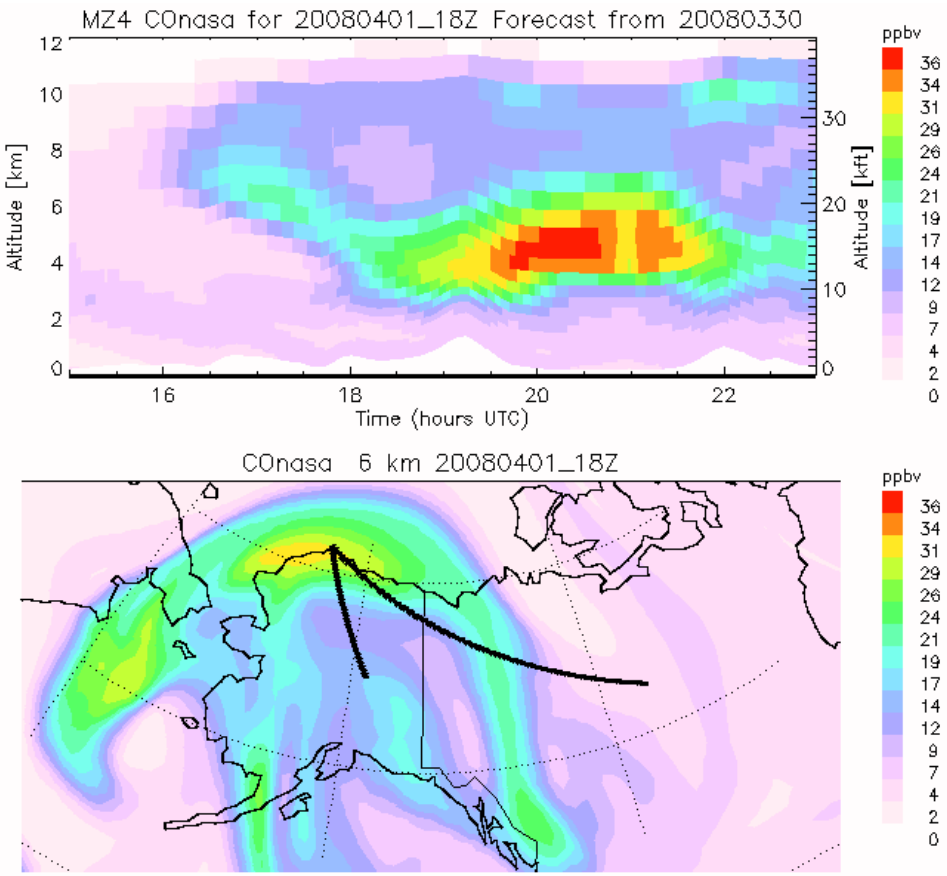
MOZART-4/GFS forecasts from Mar 30 for Mar 31 18Z

- Biomass burning plume from S. Asia at altitude on transit to Barrow
- Anthro Asian pollution 4-6 km over Barrow

S.Asia Fires



N.Asia Anthro

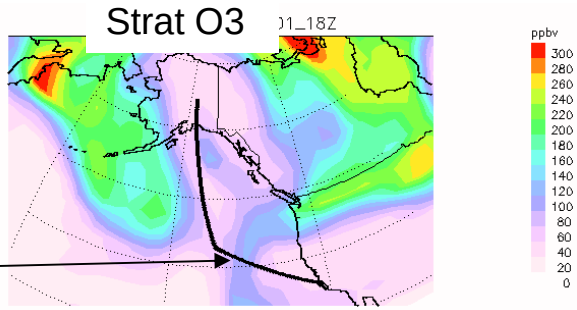


Apr 1 DC-8 Palmdale to Fairbanks

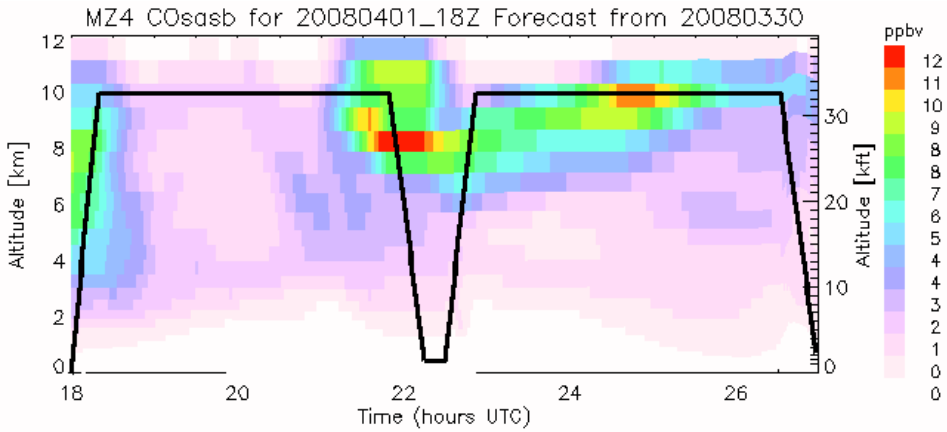
MOZART-4/GFS forecasts from Mar 30 for Mar 31 18Z

- May encounter biomass burning plume from S. Asia on spiral and on north leg
- N.Asia and S. Asia anthro mixed in
- Weak Strat O3 intrusion on first leg

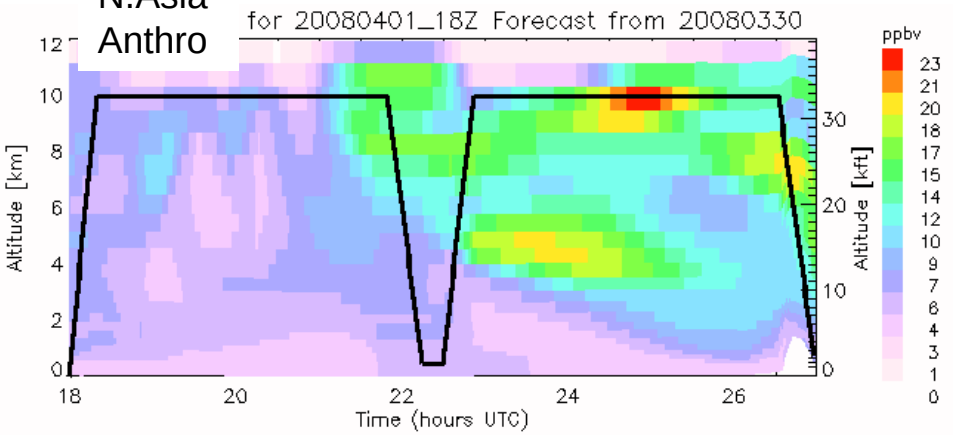
Strat O3

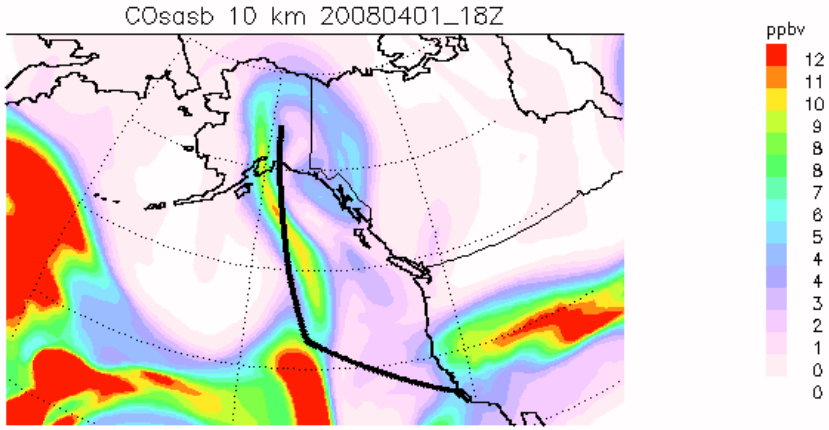


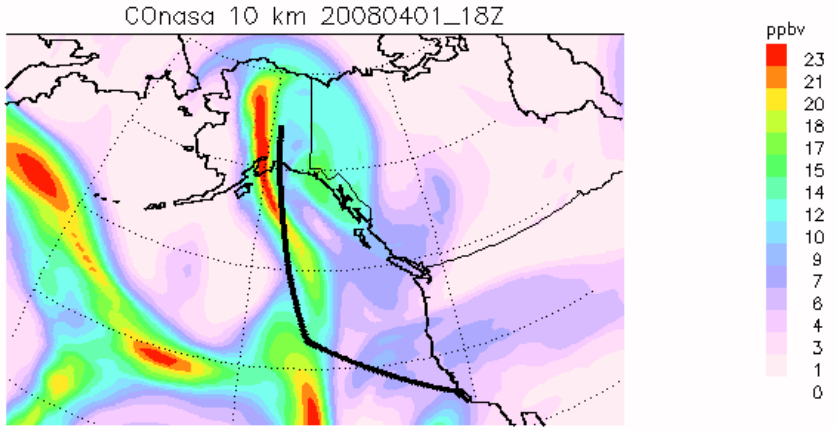
S.Asia Fires



N.Asia Anthro



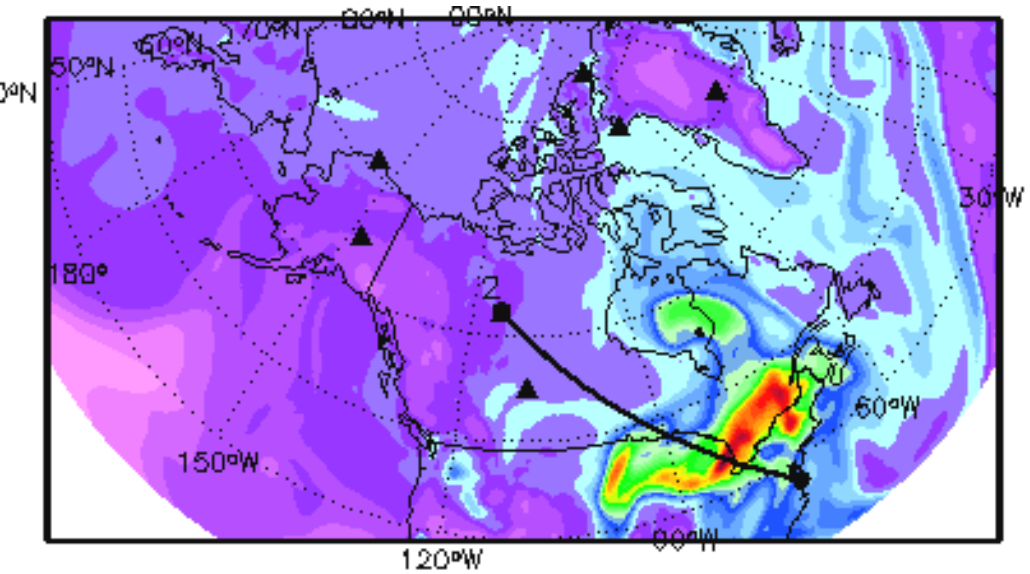




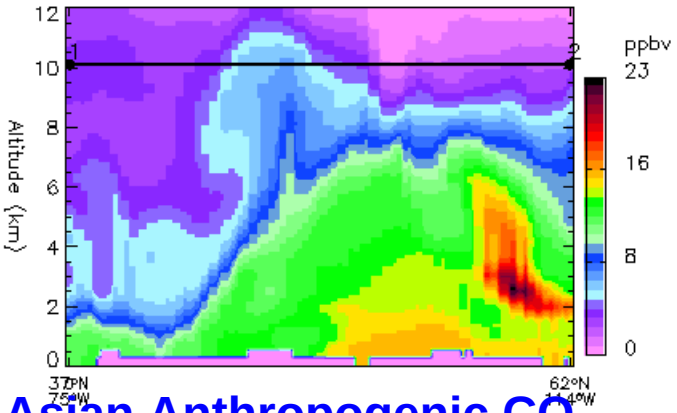
GEOS-5 CO forecasts

forecast from 20080330_06Z

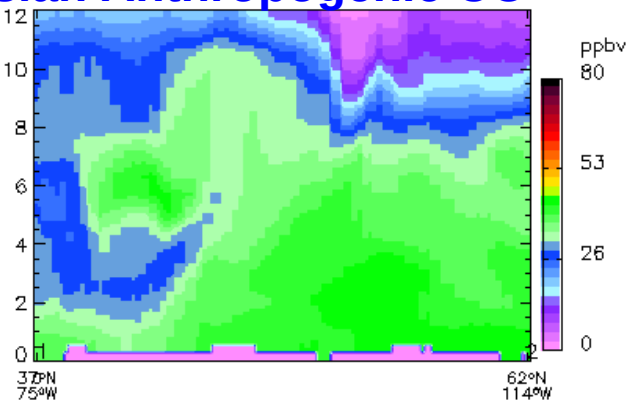
Wallops to Yellowknife 3/31



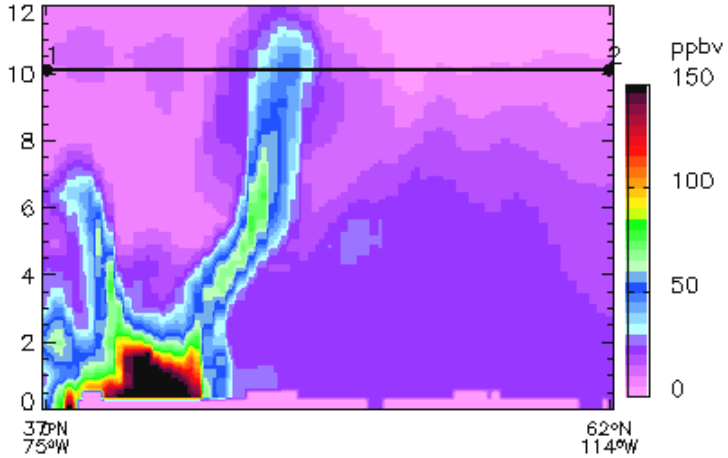
European Anthropogenic CO



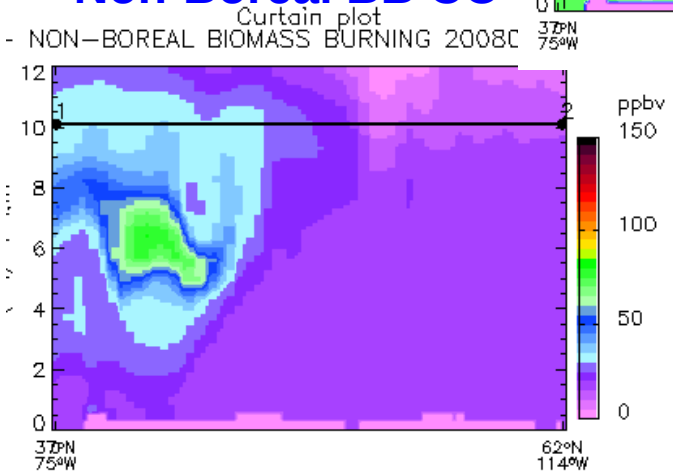
Asian Anthropogenic CO



N. American Anthropogenic CO

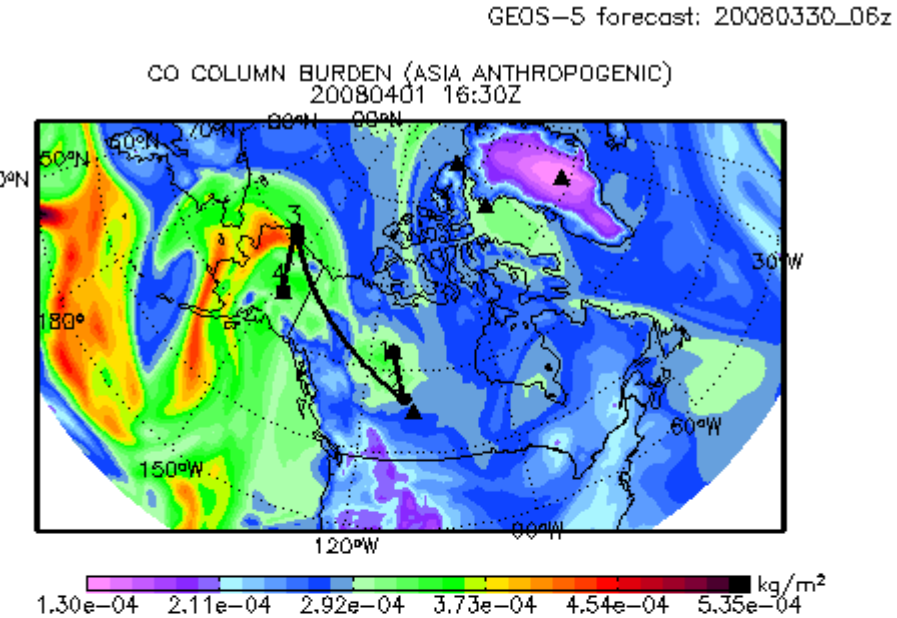


Non-Boreal BB CO

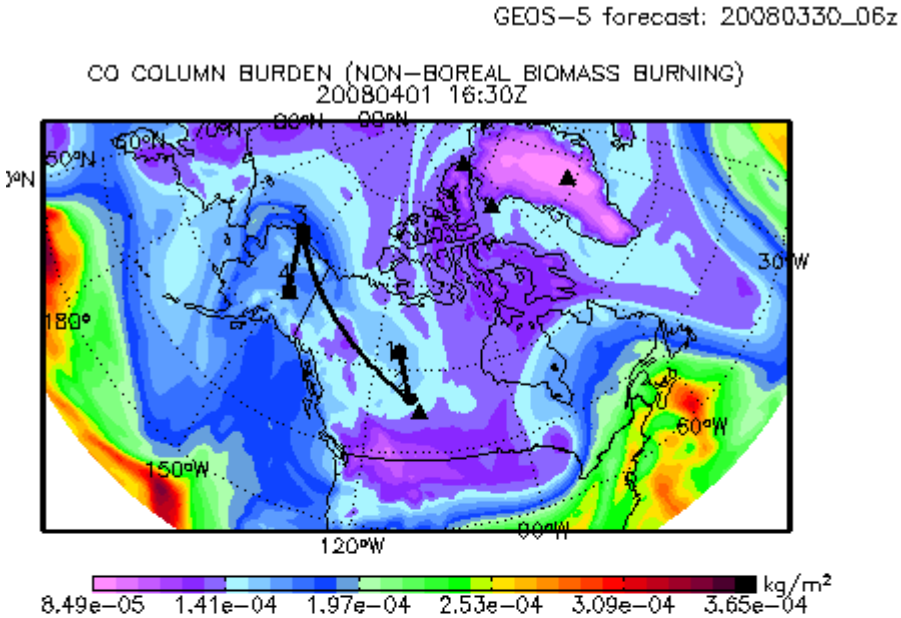


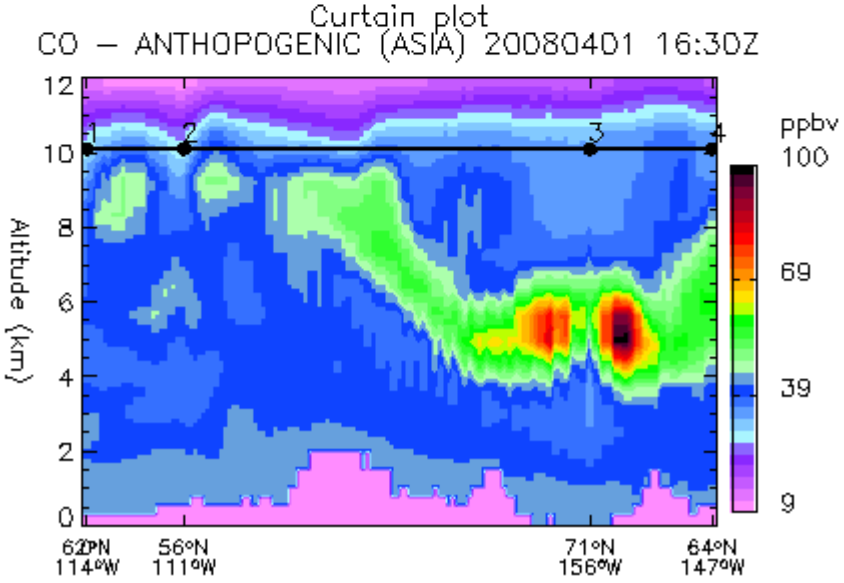
Yellowknife to Fairbanks 4/1

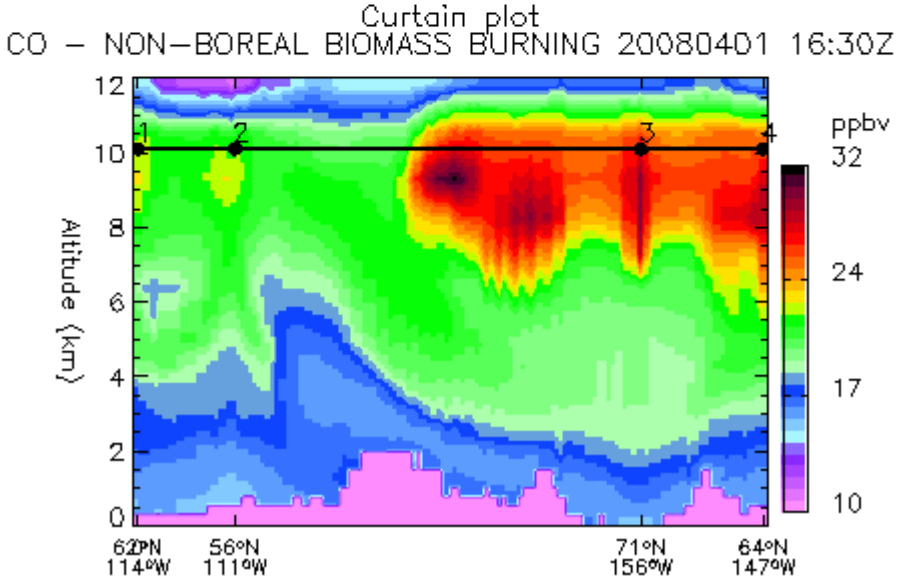
Asian Anthropogenic CO



Asian Biomass Burning CO

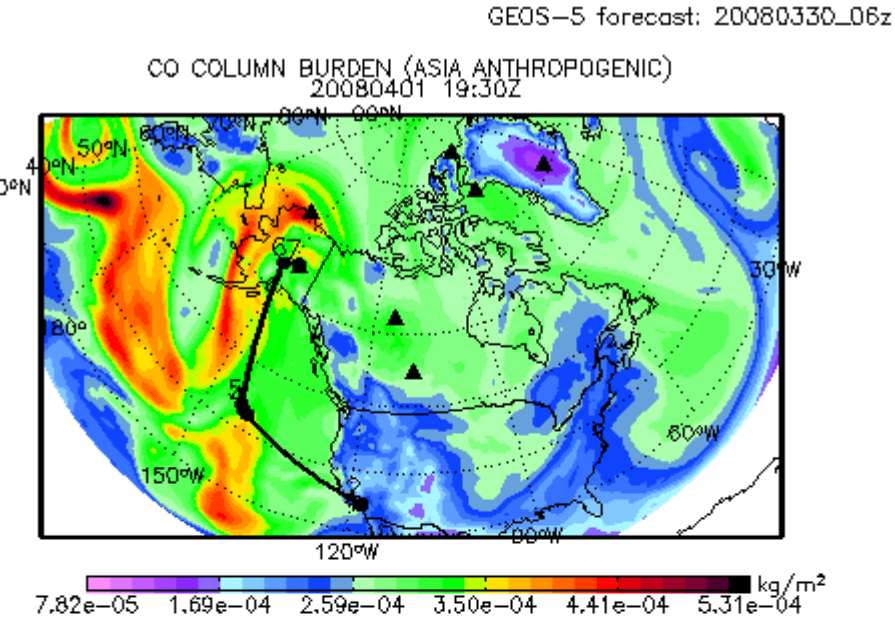




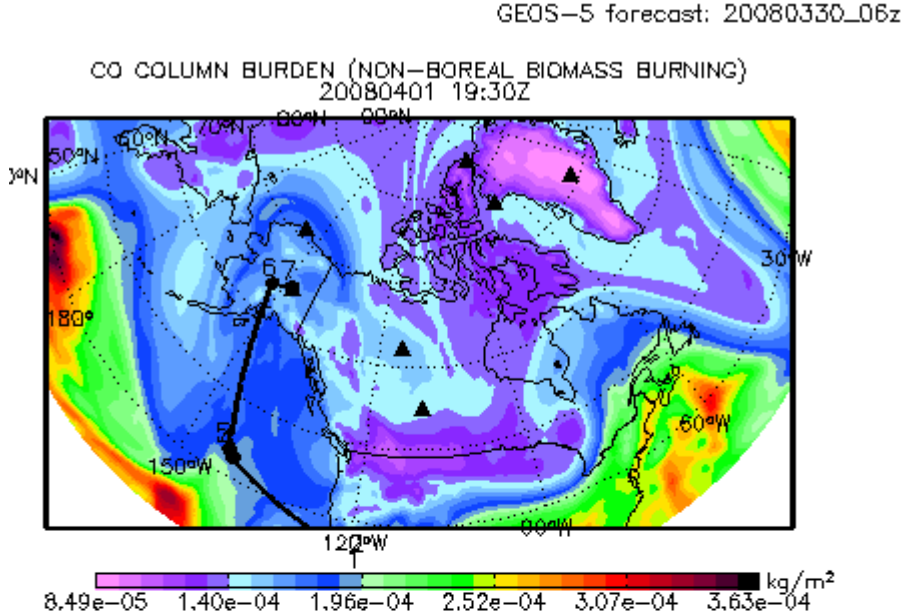


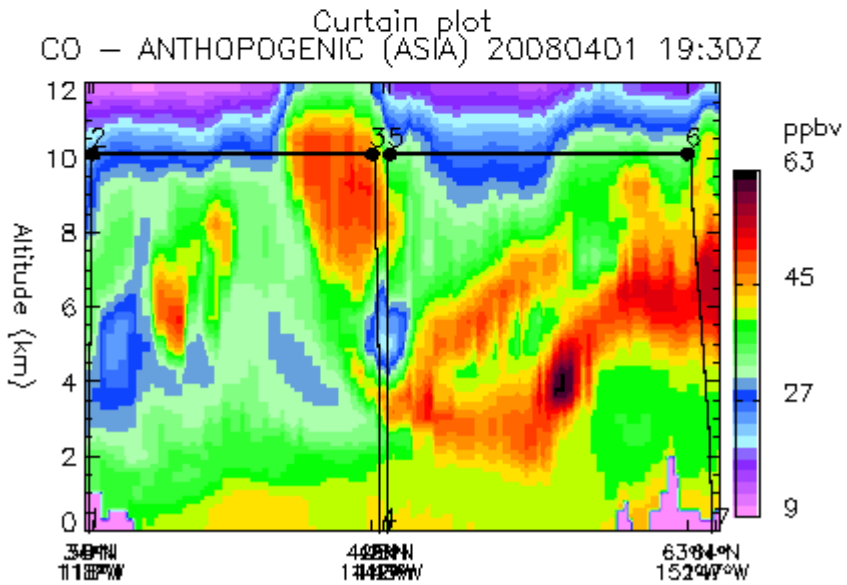
Palmdale to Fairbanks 4/1

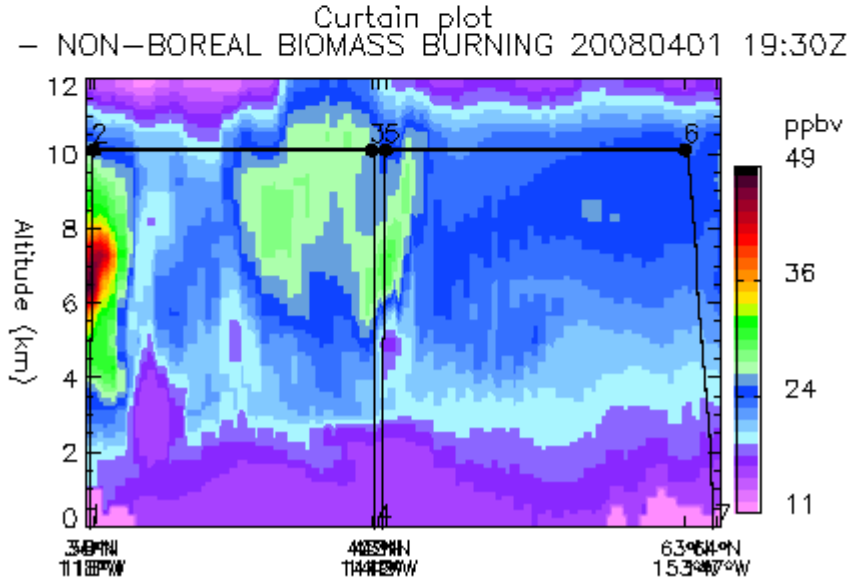
Asian Anthropogenic CO

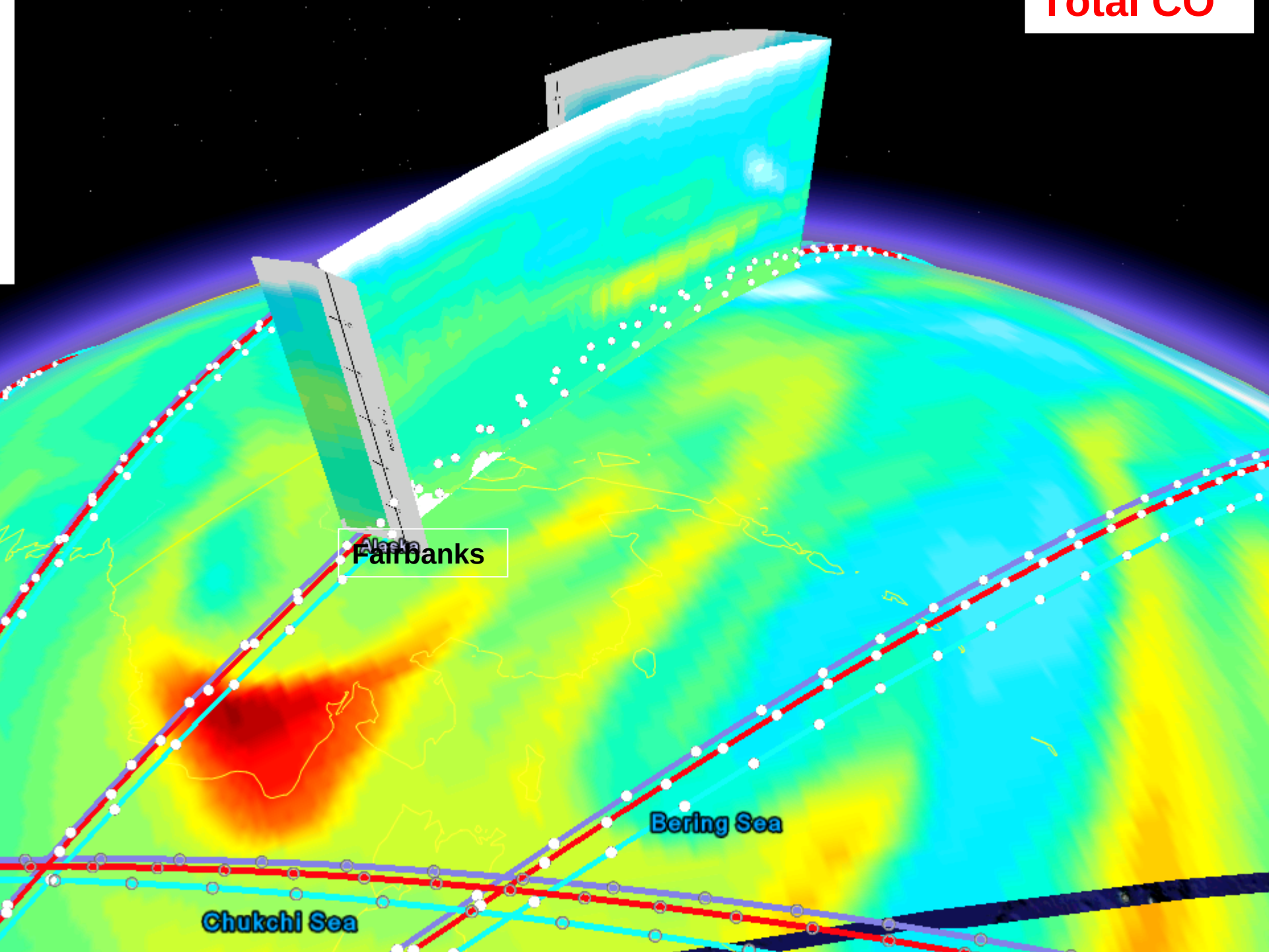


Non-Boreal Biomass Burning CO

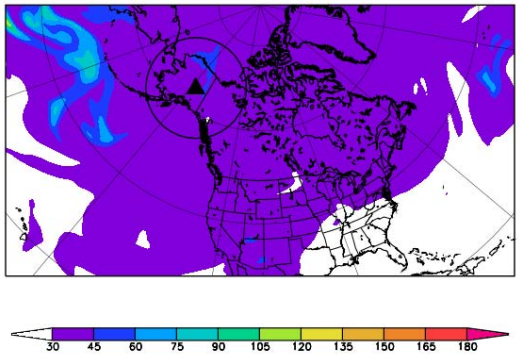




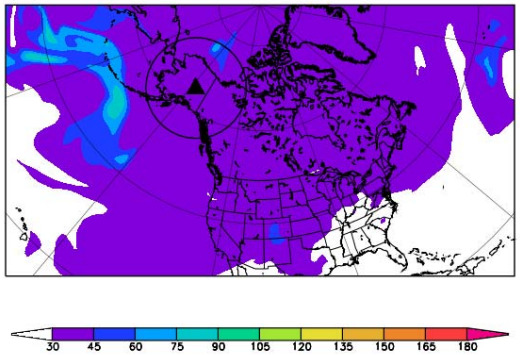



Total CO
Alaska
Fairbanks
Bering Sea
Chukchi Sea

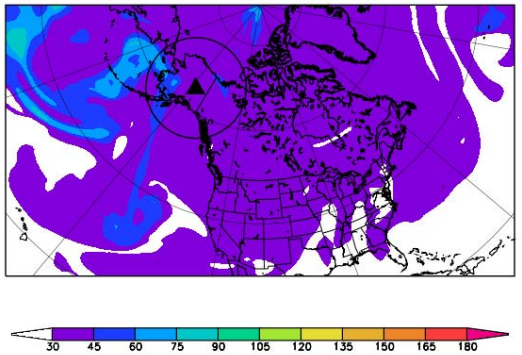
CO @ 500hPa (non-Russia Asian fossil fuel sources) [ppbV]
07:30Z30MAR2008



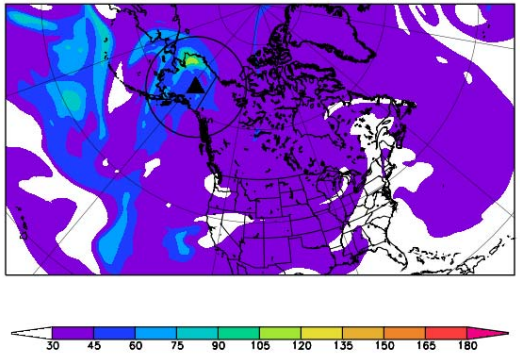
CO @ 500hPa (non-Russia Asian fossil fuel sources) [ppbV]
16:30Z30MAR2008



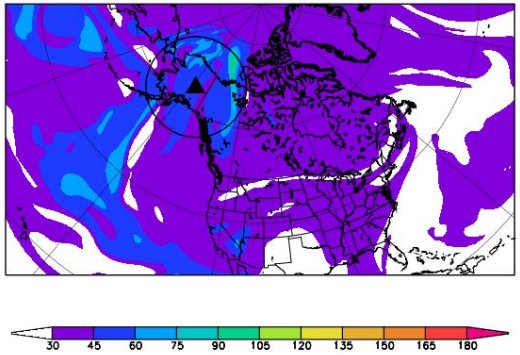
CO @ 500hPa (non-Russia Asian fossil fuel sources) [ppbV]
16:30Z31MAR2008



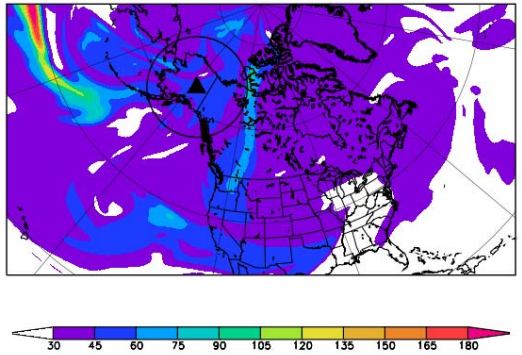
CO @ 500hPa (non-Russia Asian fossil fuel sources) [ppbV]
16:30Z01APR2008



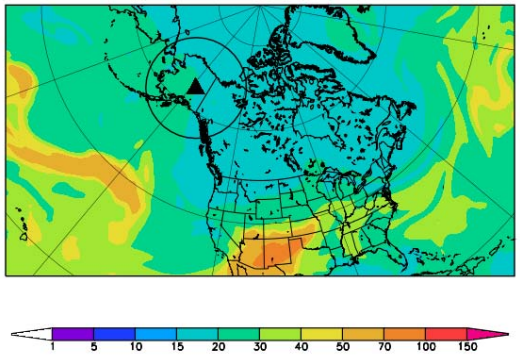
CO @ 500hPa (non-Russia Asian fossil fuel sources) [ppbV]
16:30Z02APR2008



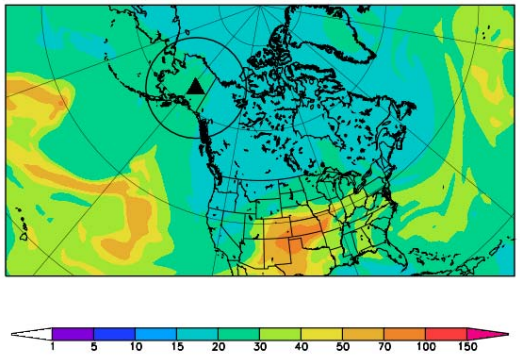
CO @ 500hPa (non-Russia Asian fossil fuel sources) [ppbV]
16:30Z03APR2008



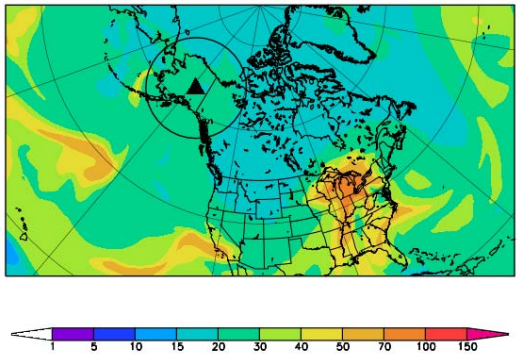
CO @ 500hPa (non-boreal biomass burning sources) [ppbV]
07:30Z30MAR2008



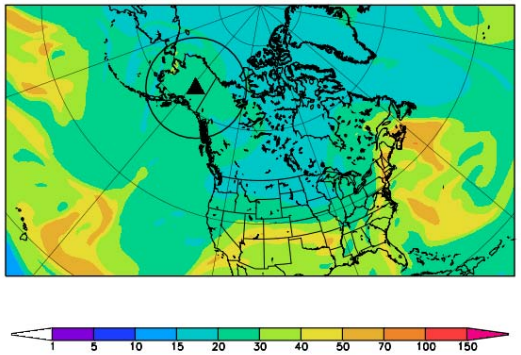
CO @ 500hPa (non-boreal biomass burning sources) [ppbV]
16:30Z30MAR2008



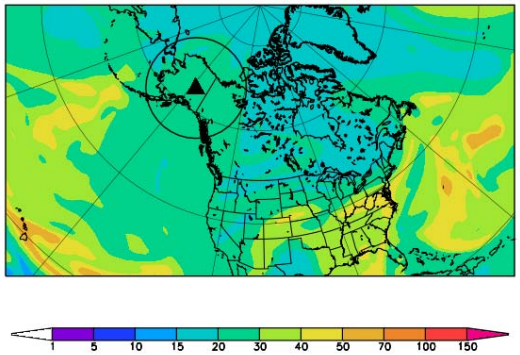
CO @ 500hPa (non-boreal biomass burning sources) [ppbV]
16:30Z31MAR2008



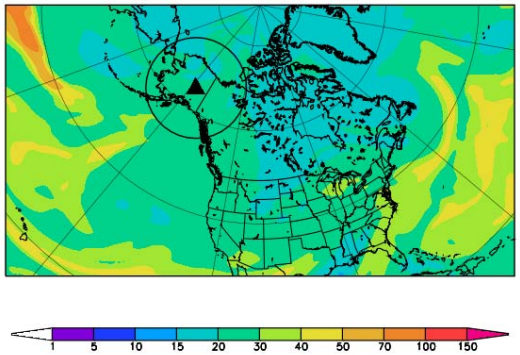
CO @ 500hPa (non-boreal biomass burning sources) [ppbV]
16:30Z01APR2008



CO @ 500hPa (non-boreal biomass burning sources) [ppbV]
16:30Z02APR2008



CO @ 500hPa (non-boreal biomass burning sources) [ppbV]
16:30Z03APR2008

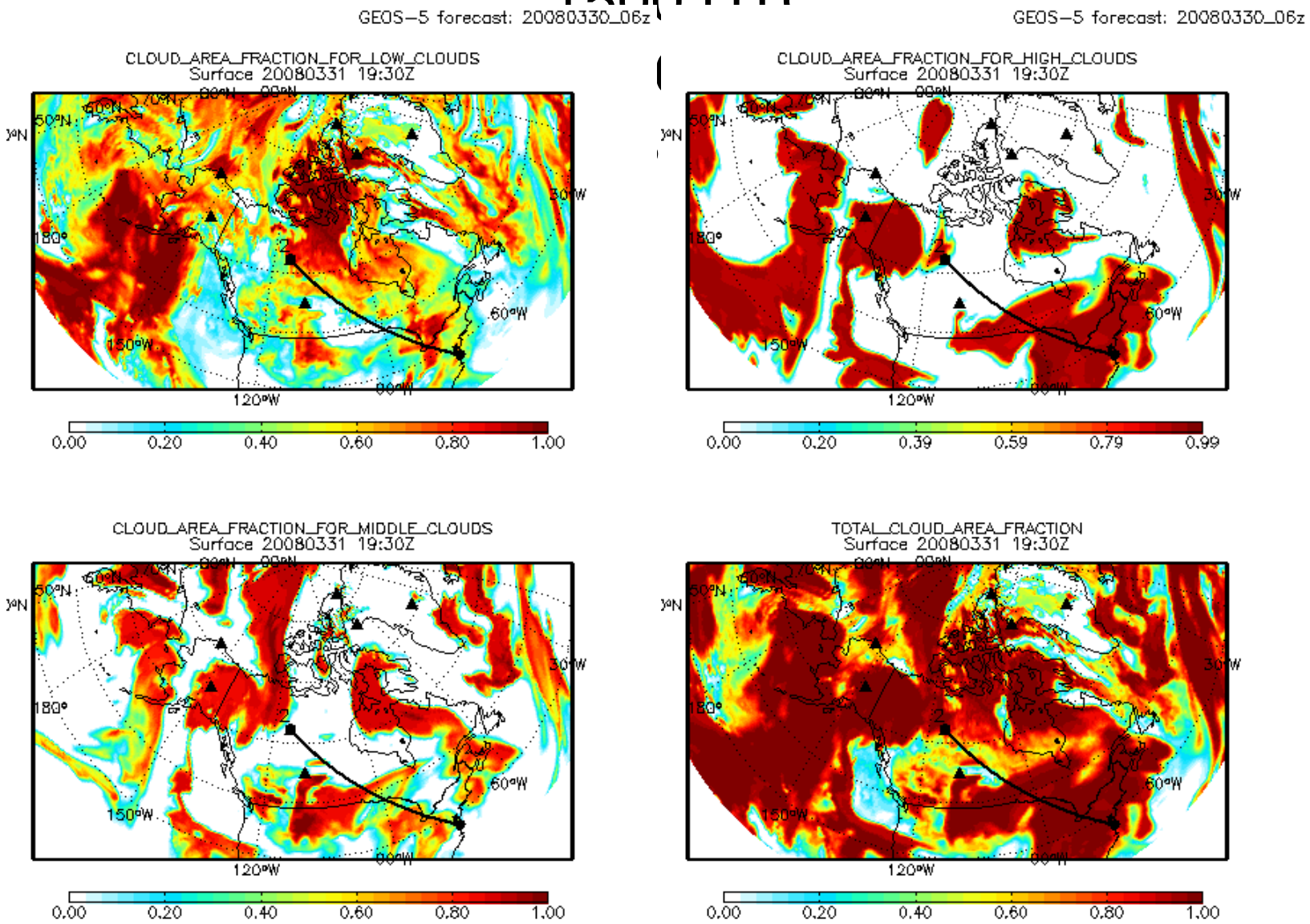


GEOS-5 Aerosol forecasts

forecast from 20080330_06Z

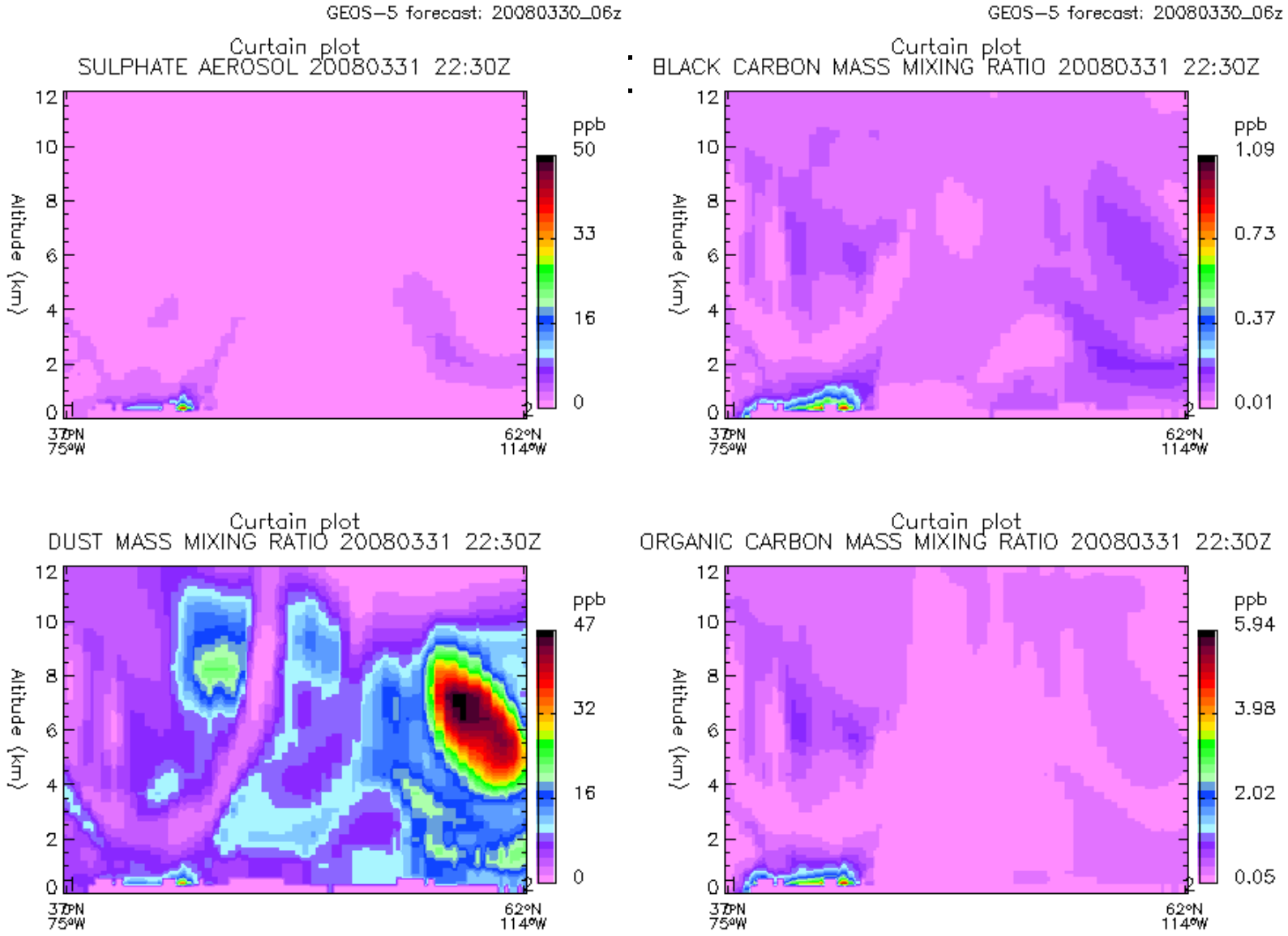
3-31-2008: Wallops to Yellowknife

Take off from Wallops (37.94N, 75.46W): 1100 LT – 1500 UTC

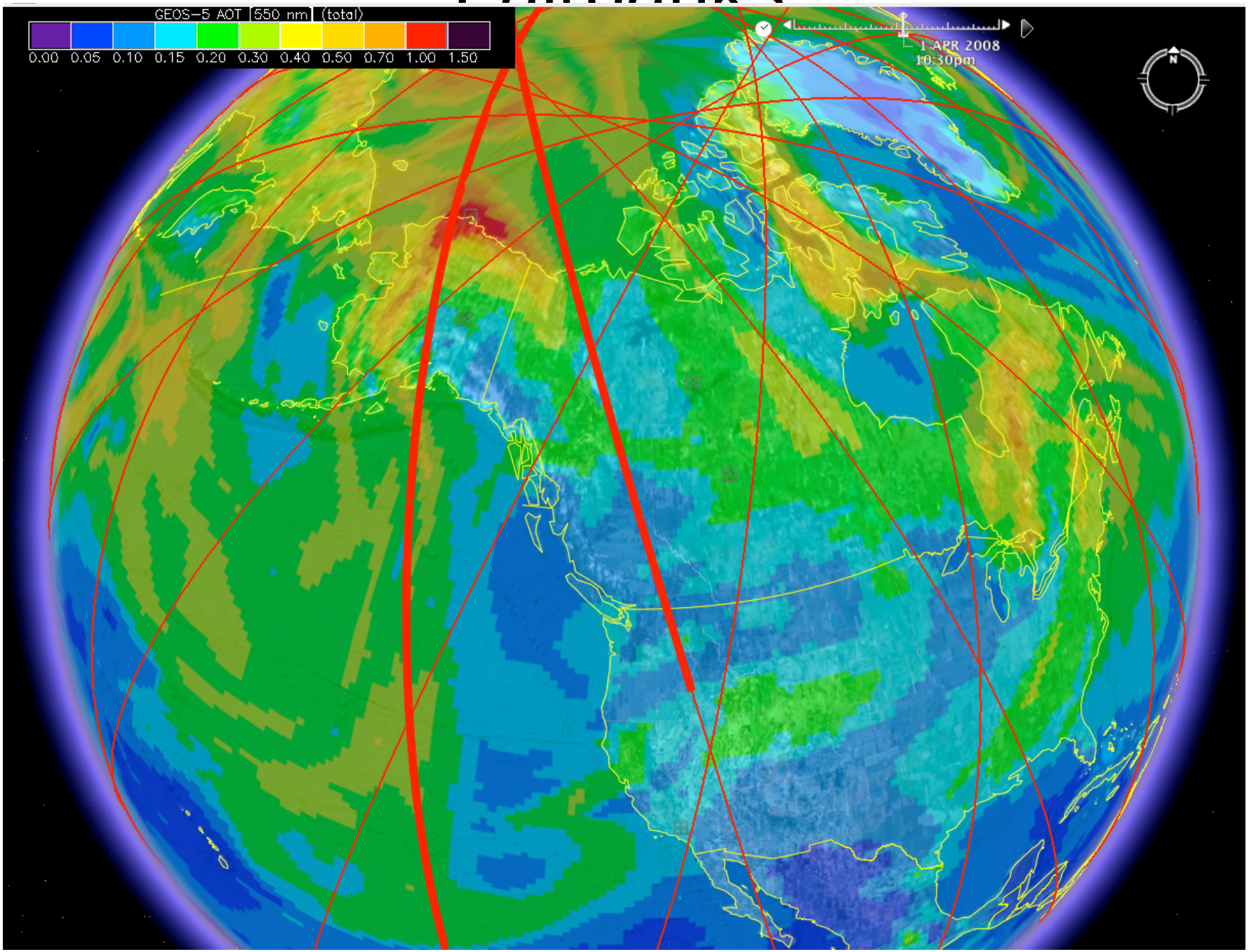


3-31-2008: Wallops to Yellowknife

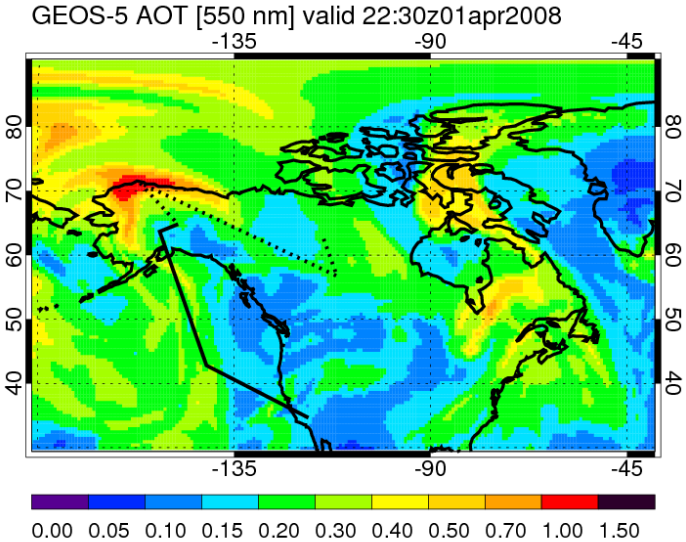
3/31 22:30 UTC (18:30 LT Wallops, 15:30

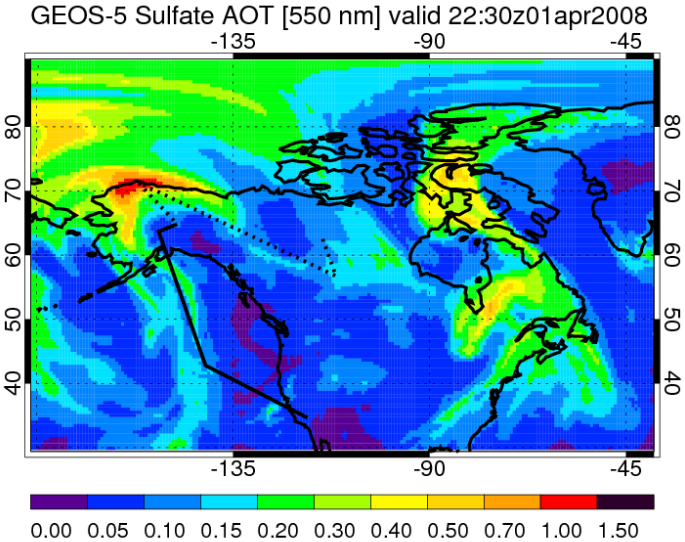


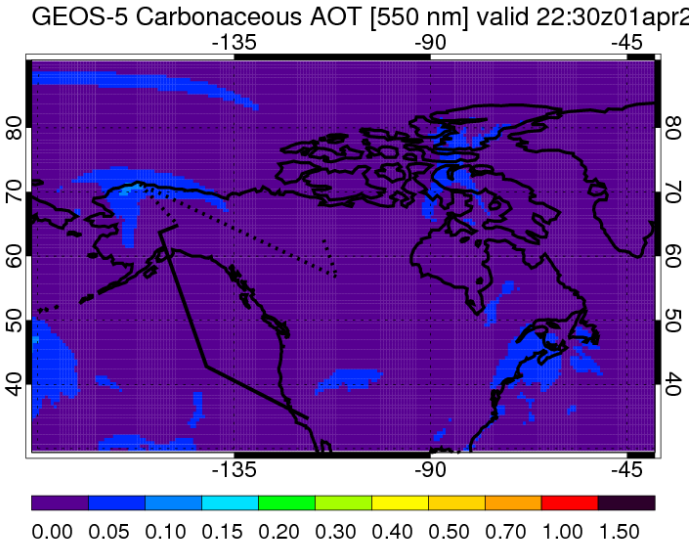
Fairbanks

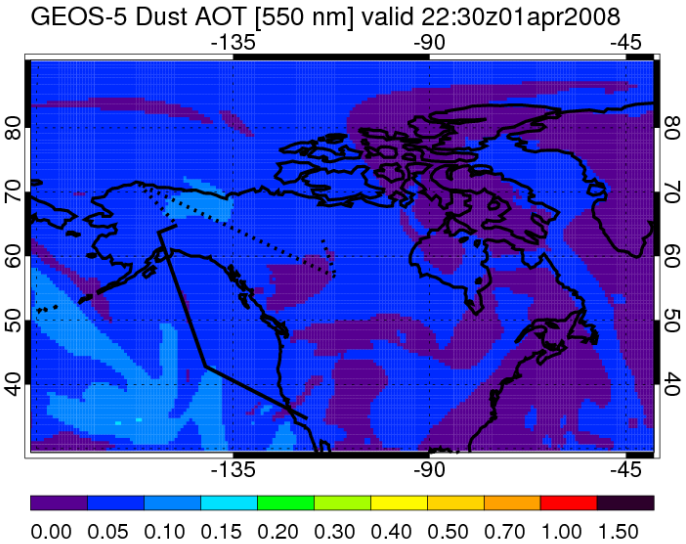

GEOS-5 AOT [550 nm] (total)
0.00 0.05 0.10 0.15 0.20 0.30 0.40 0.50 0.70 1.00 1.50
1-APR 2008
10:30pm
N

4-1-2008: DC-8 and P-3 to irbar



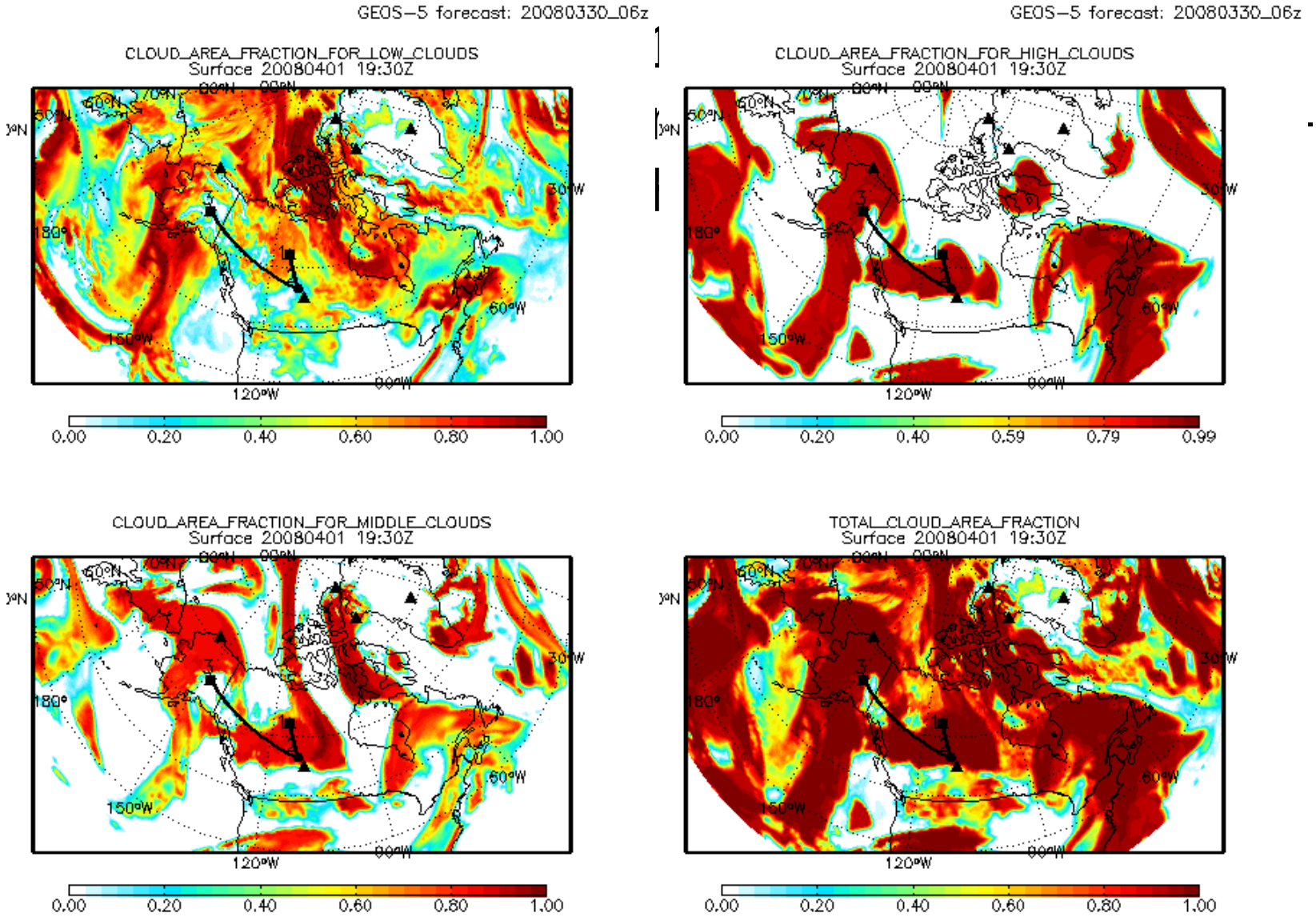




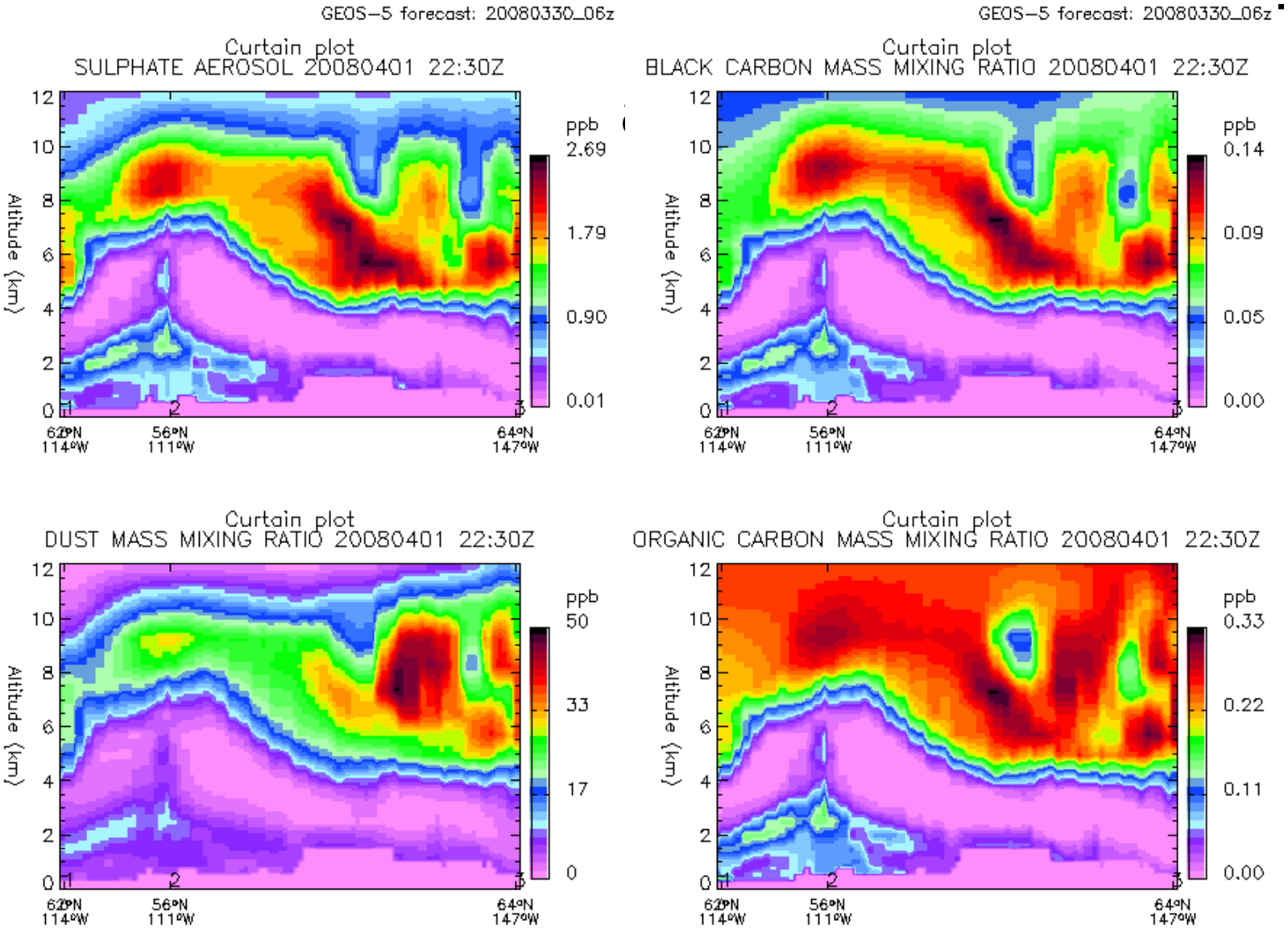


McMurray – Fairbanks

Yellowknife (62.46N, 114.45W) to Fort McMurray



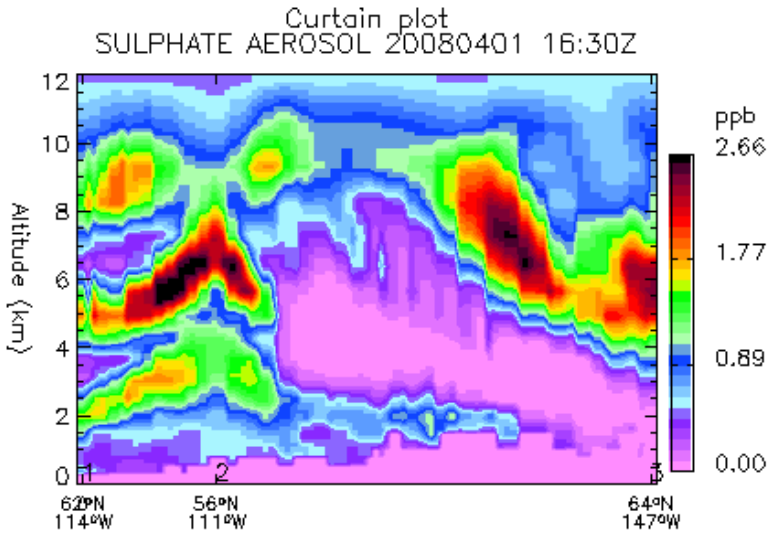
4-1-2008: (a) Yellowknife – Fort McMurray – Fairbanks



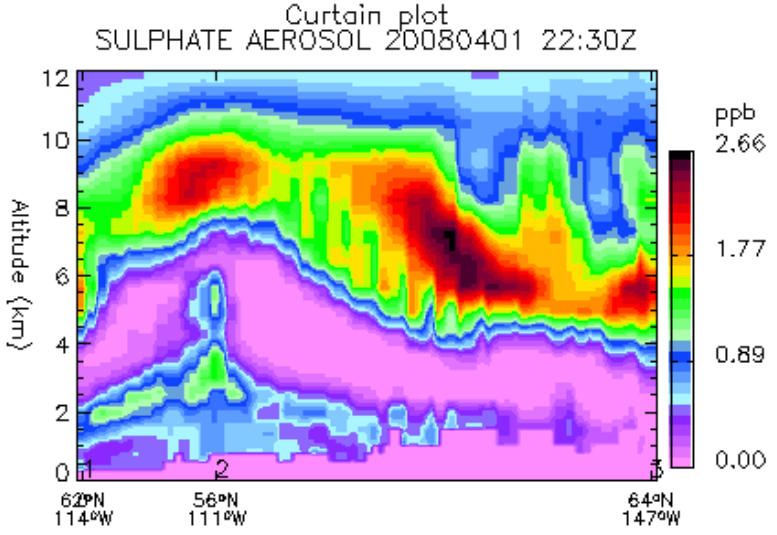
4-1-2008: (a) Yellowknife – Fort McMurray – Fairbanks

GEOS–5 forecast: 20080330_06z

1630Z

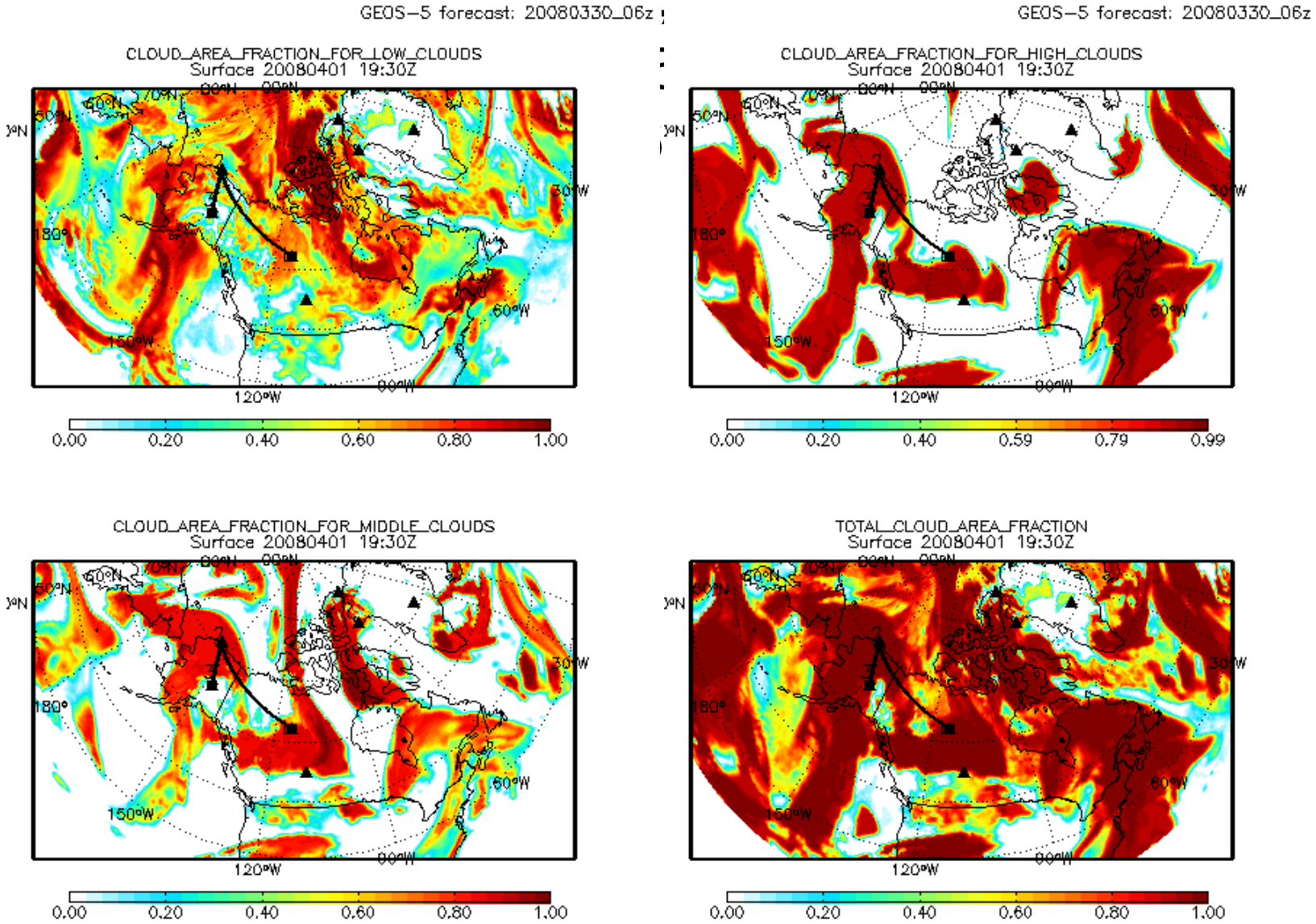


2230Z

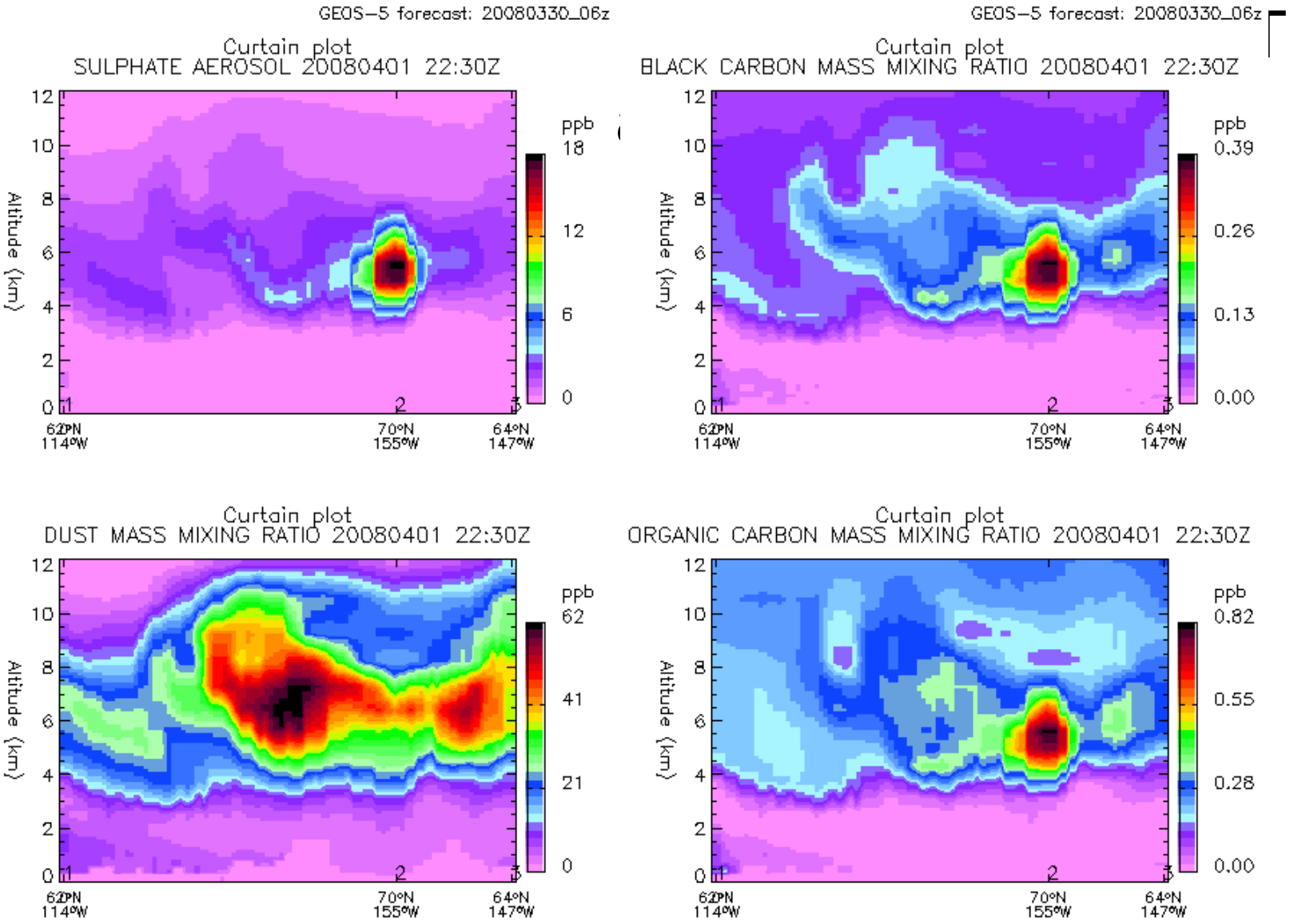


+ 1 2008: (b) Yellowknife – Barrow – Fairbanks

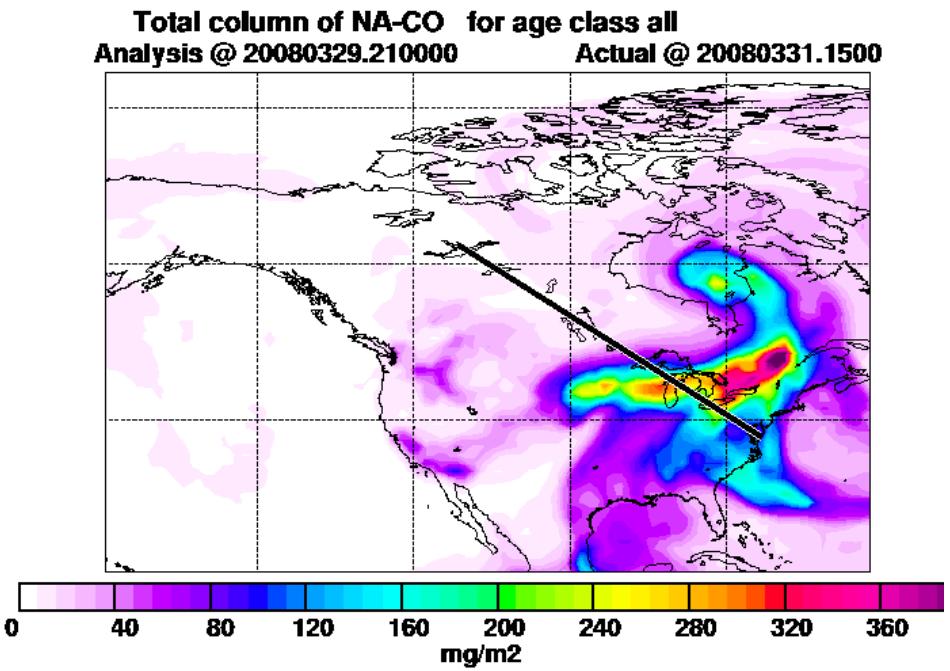
Yellowknife (62.28N, 114.27W) to Barrow

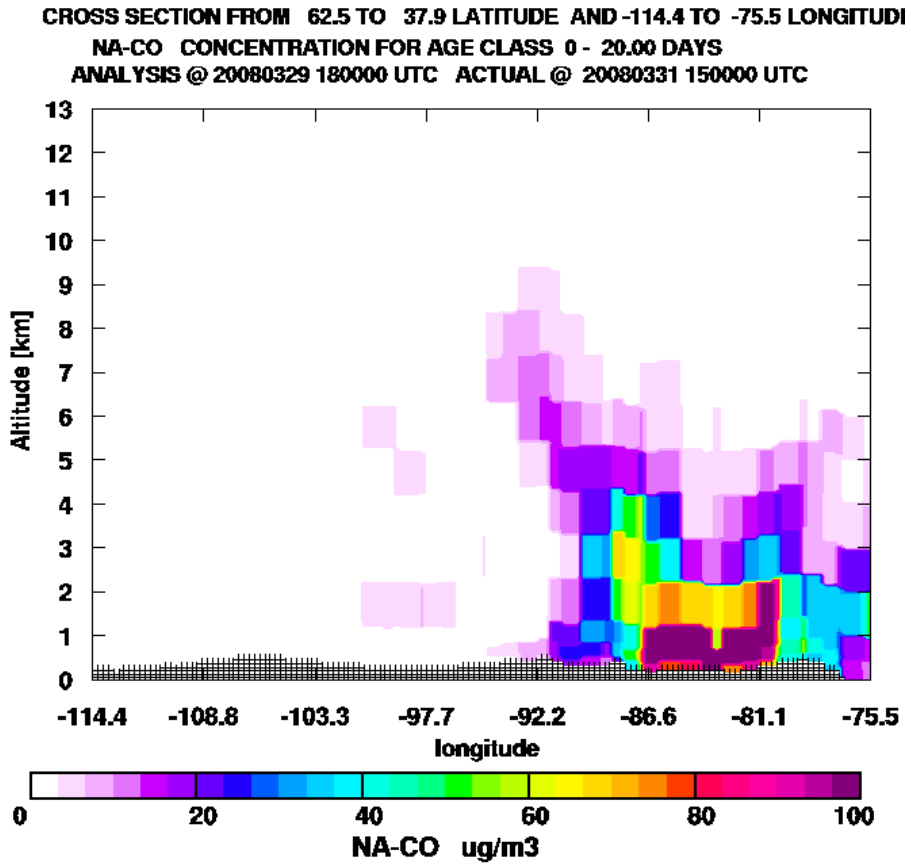


4-1-2008: (b) Yellowknife – Barrow – Fairbanks



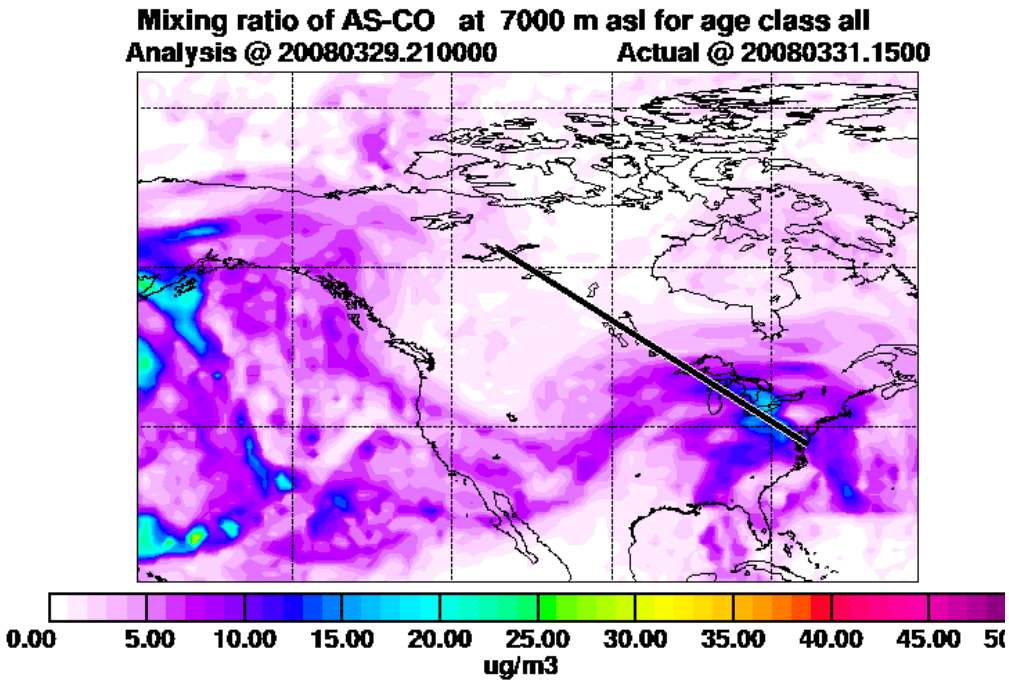
FLEXPART FC, 15-21 UTC 31 Mar, N. American plume

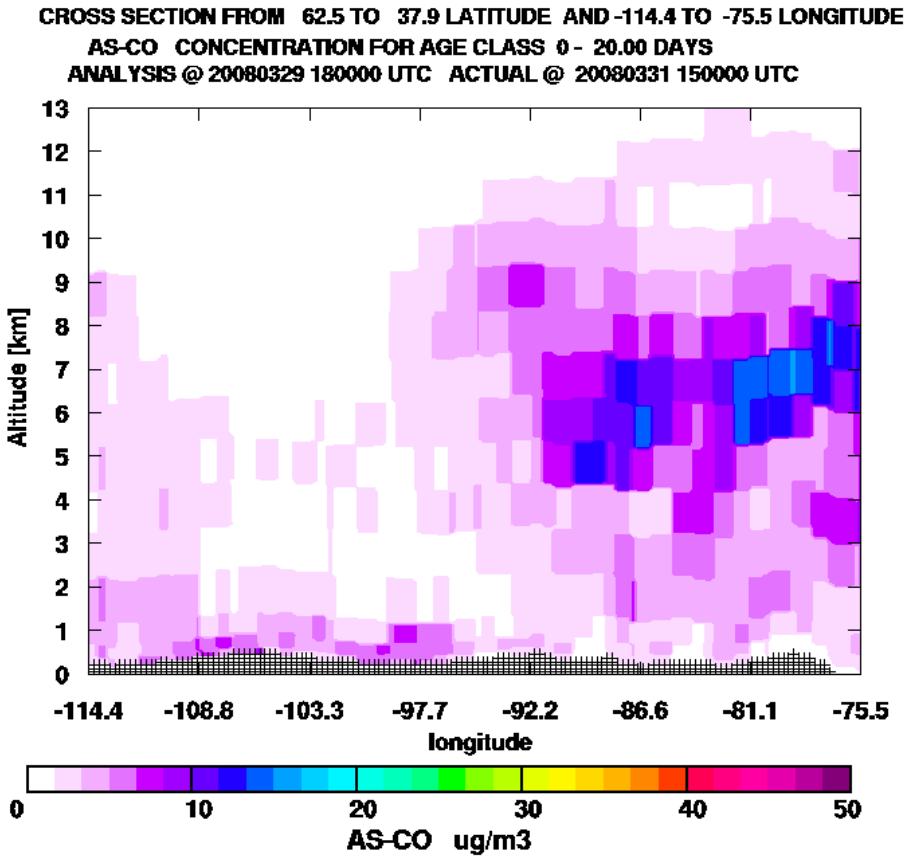




mostly below 3km alt, some up to 4-5km. Plume max south of Lake Superior. Possibly some BC at lowest levels.

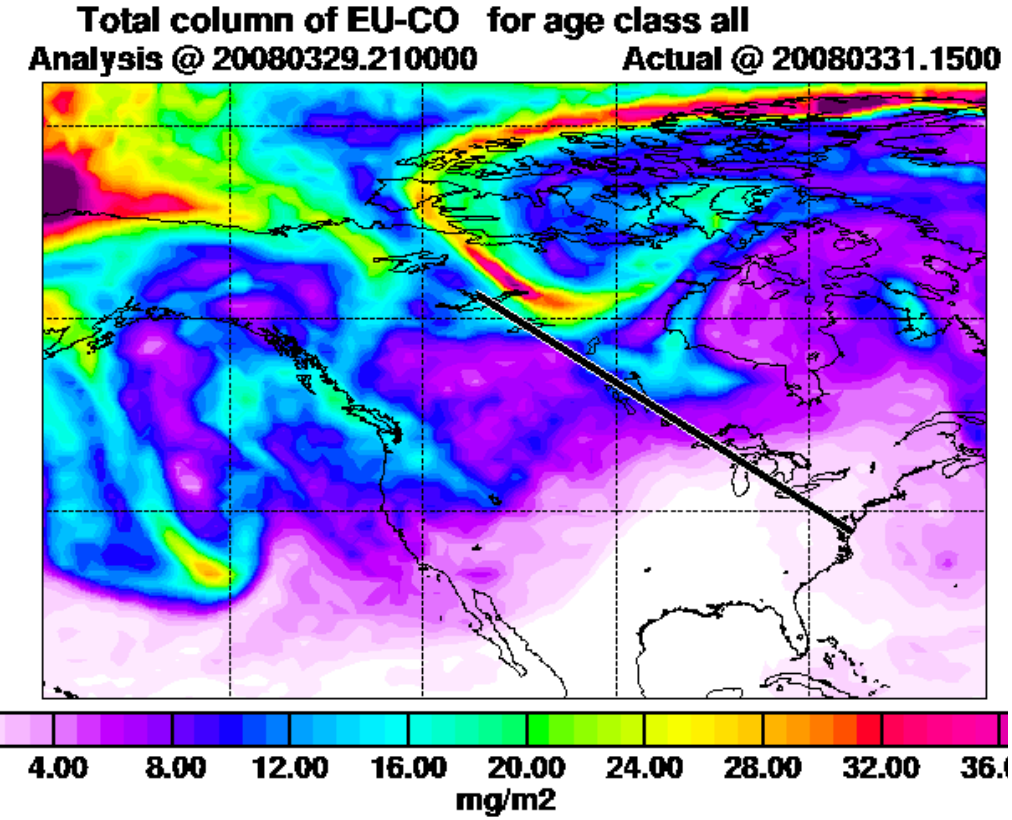
FLEXPART FC, 15-21 UTC 31 Mar, Asian plume

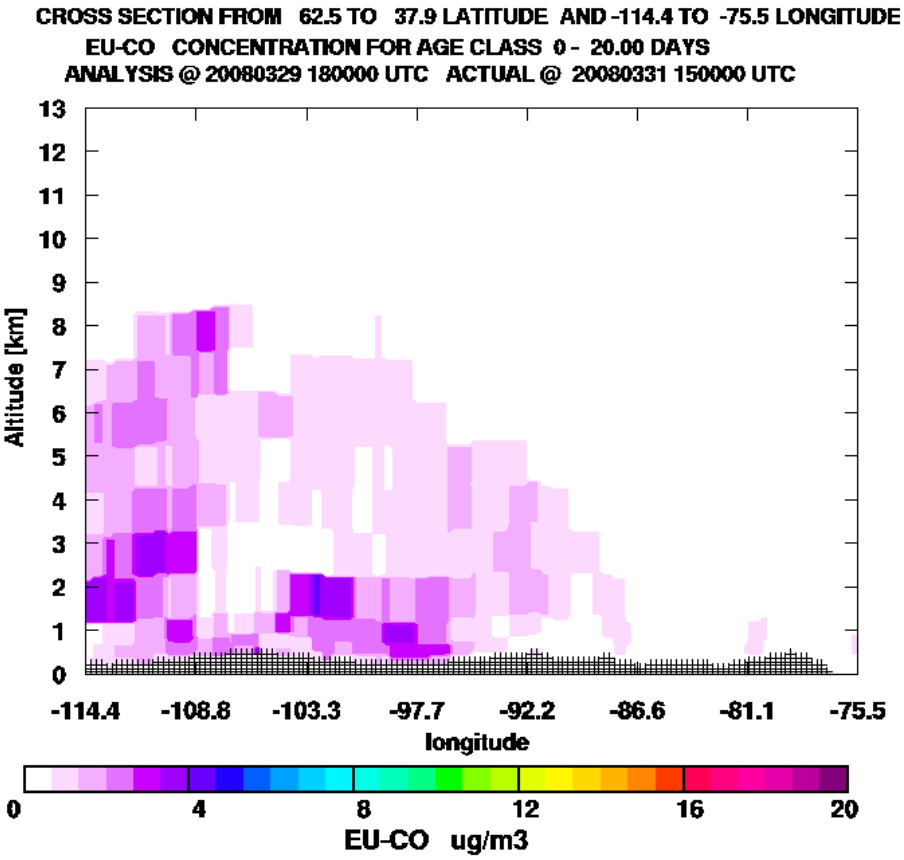




max at 7km alt along jet stream, south of 50N. Vertical extent 4-8km alt.

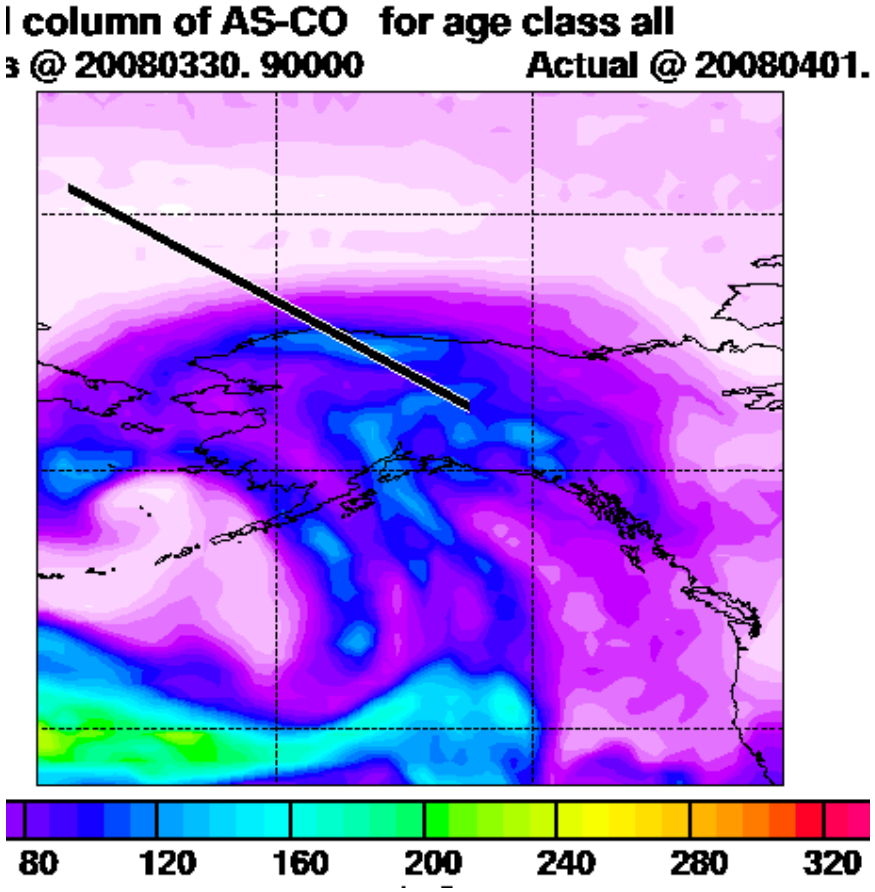
FLEXPART FC, 15-21 UTC 31 Mar, EU plume

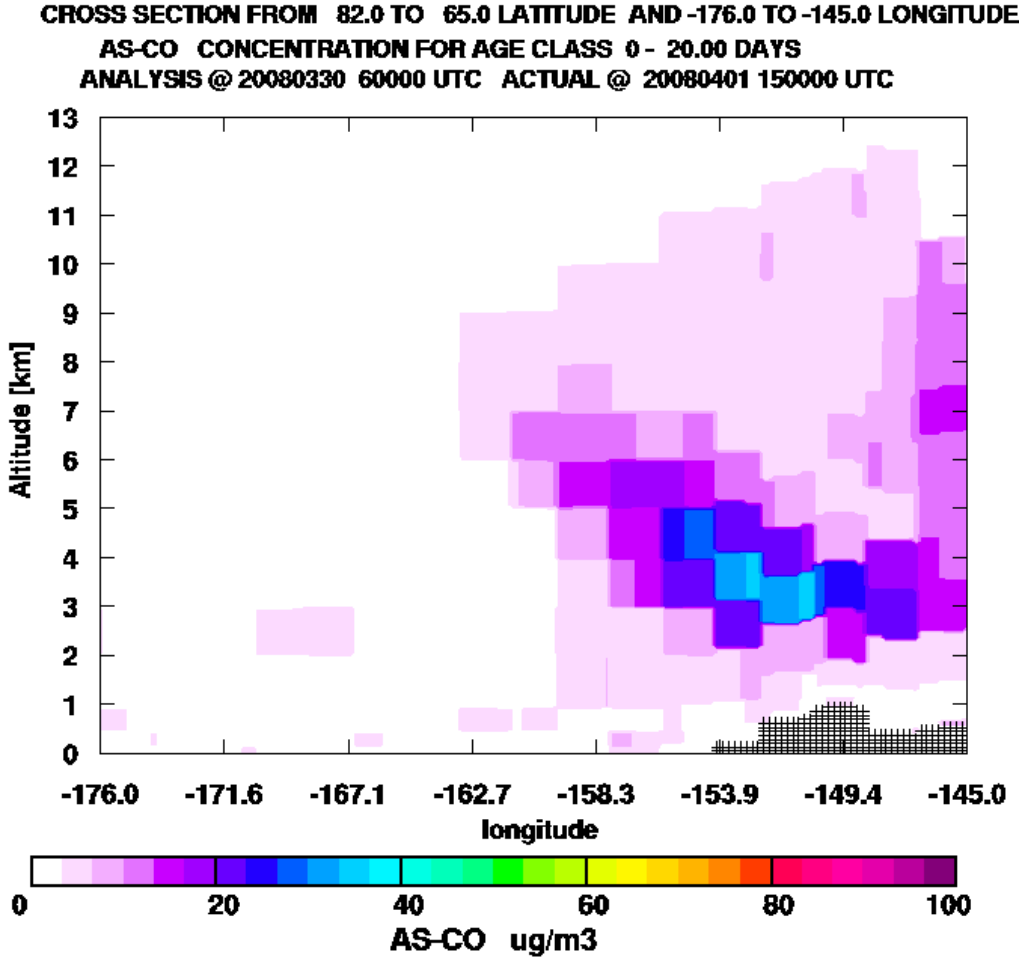




possible encounter with plume north of 50N, further towards the east, mostly around 2-3km alt.

FLEXPART FC, 15-21 UTC 1 Apr, AS plume





FLEXPART FC, 15-21 UTC 1 Apr, EU plume